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ABSTRACT

The results of the 1972-1981 National Science Foundation surveys on academic research and development (R&D) funds, the employment and utilization of scientists and engineers, and the characteristics of graduate students enrolled in the sciences and engineering (S/E) are presented. Findings include the following: the steady growth to university S/E employment and graduate S/E enrollment that characterized the 1970s was maintained into 1980, but a downturn in R&D expenditures in real dollars is occurring in 1981; academic R&D expenditures from all financial sources accounted for about one-tenth of the national R&D total; during the 1977-79 period, nonfederally funded R&D expenditures at universities and colleges grew at an average annual rate nearly twice that of federally financed R&D expenditures; as in earlier years, the life sciences accounted for more than one-half of all academic R&D expenditures in 1979; capital expenditures for S/E activities at universities and colleges fell at an average annual rate of three percent, or nearly 10 percent in constant dollars between 1972 and 1979; the 325,000 scientists and engineers employed in higher education institutions in January 1980 represents a three percent per year increase over the number employed in 1978; life scientists made up the largest single group of academic S/E professionals through the 1973-1980 period; 375,000 students were enrolled in courses of study leading to graduate degrees in S/E, up two percent per year since fall 1977; and women made up 33 percent of the full-time S/E graduate students enrolled in doctorate-granting institutions in 1980, up from 25 percent in 1975. Questionnaires, statistical tables, and technical notes are appended. (SW)

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foreword

As the Nation enters another decade, its higher education system faces a new period of challenges. Declining birthrates have led some authorities to predict a period of enrollment retrenchment accompanied by static or declining numbers of faculty because of the large number of new tenure-track positions filled by young scholars during the expansion period of the sixties. Even as overproduction of new Ph.D.'s is feared in some fields, other fields are likely to encounter shortages because new graduates are not attracted into advanced study. At the same time, a new mood of fiscal conservatism appears in legislative bodies at both the Federal and State levels.

Universities and colleges have traditionally fulfilled two crucial roles within America's scientific and engineering (S/E) effort. They are the chief suppliers of S/E personnel so necessary for the national welfare. They also are the largest performer of basic research which provides the foundation for much of our technology. In other developed countries the expansion of knowledge has primarily been the function of either research institutes or government laboratories; in the United States the academic community has been much more heavily involved in the performance of basic research than either of the other types of organizations.

Decisions of State and Federal legislators, budget officials in the executive branches of all levels of government, and administrators in universities and colleges and educational organizations all depend upon the availability of data on the various characteristics of academic S/E programs. It is the purpose of this report to provide such data. It is the second in a series of biennial publications analyzing data collected in the National Science Foundation's (NSF's) surveys of academic R&D expenditures, the employment and utilization of scientists and engineers, and the characteristics of graduate students enrolled in the sciences and engineering. These reports replace the earlier series of annual publications which presented the results of each of the three surveys separately. The revised format is intended to facilitate analyses by integrating data from more than one survey series, as well as providing some comparisons with statistics derived from other sources. Any comments or suggestions for improvements in the data presentation will be welcome.

Charles E. Falk
Director, Division of Science
Resources Studies
National Science Foundation
Directorate for Scientific,
Technological, and
International Affairs

December 1981

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notes

- The abbreviation "S/E" refers to "science and engineering."
- Unless constant dollars are specified, data for research and development and capital expenditures are shown in current dollars. When constant dollars are discussed, they represent an adjustment to the 1972 level and are converted to a fiscal-year basis. The gross national product (GNP) implicit price deflator prepared by the Department of Commerce is used as the basis for the conversion. (See table A-3 for actual values.)
- Data in part 1 cover fiscal years (FY's); data in part 2 are collected as of January in each year, data in part 3 are collected as of fall in each year.
- During the 1978-79 survey cycle, an attempt was made to collect some data items on a short form mailed to doctorate-granting institutions only. FY 1978 expenditures data, January 1979 personnel data, and fall 1978 graduate student data are therefore unavailable for all institutions, although an estimate was made for total FY 1978 expenditures at nondoctorate-granting institutions. In addition, no data are available for those items excluded from the short forms, e.g., capital expenditures, full-time-equivalent (FTE) scientists and engineers, and support mechanisms of graduate students. These data gaps are reflected in the text and in detailed statistical tables.
- Appendix tables at the end of this report are designed to provide the detailed data shown in the charts. Tabulations based on NSF survey findings have been compiled from the most recent publications, and data are subject to revision in subsequent years.
- Details shown in appendix tables may not add to totals because of rounding.
- For longer term and more detailed analyses, refer to data tabulated and illustrated in the publications listed on cover 2 of this report.

For information on the availability of data tapes, contact:

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acknowledgments

This report was prepared in the Universities and Nonprofit Institutions Studies Group of the Division of Science Resources Studies by J. G. Huckenpahler, under the direction of Penny D. Foster, Study Director. James Hoehn and Richard Bennof assisted in the preparation of the report; statistical assistance was provided by M. Margaret Machen. William L. Stewart, Head of the R&D Economics Studies Section, and Charles E. Falk, Director, Division of Science Resources Studies, provided general guidance and review. Numerous university and college officials provided the essential annual statistics for the three major NSF surveys of academic science and engineering that form the basis for this analysis.

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highlights

This summary report presents data from three surveys conducted annually by NSF. Expenditures data are collected on a fiscal-year basis and are available for 1972-79 (with preliminary data for 1980); personnel data are available for January 1973 through January 1980; and data on graduate enrollment are collected as of fall of each year from 1975 through 1979.

overall trends

- The steady growth to university S/E employment and graduate S/E enrollment that characterized the seventies was maintained into 1980, but a downturn in R&D expenditures in real dollars is occurring in 1981.
- Although only about 1 in 10 institutions of higher education granted doctorate degrees in S/E fields, this comparatively small group (about 320 institutions) accounted for the majority of all S/E activities. Doctorate-granting institutions accounted for 98 percent of all academic R&D expenditures in 1980 and received nearly 97 percent of all Federal obligations for S/E activities. These same institutions employed 67 percent of all academic scientists and engineers and enrolled 87 percent of all S/E graduate students.

r&d expenditures

- Academic R&D expenditures from all financial sources accounted for about one-tenth of the national R&D total. They reached an estimated $6 billion in 1980, up 15 percent from the 1979 amount, equivalent to 6-percent growth in constant-dollar terms. From 1972 to 1980, R&D funds at universities and colleges grew at an average annual rate of 11 percent, or 3 percent in constant dollars. Estimates for 1981, however, indicate a growth of 6 percent over 1980, which in real-dollar terms means a decline of nearly 4 percent.
- During the 1977-79 period, nonfederally funded R&D expenditures at universities and colleges grew at an average annual rate nearly twice that of federally financed R&D expenditures—7 percent per year compared to 4 percent per year in constant dollars. These growth rates are considerably higher than the comparable rates for the 1972-79 period as a whole (4 percent per year and 2 percent per year, respectively). The most rapid growth between 1977 and 1979 was that of industrially supported R&D expenditures (10 percent per year in constant dollars); but industrial firms in 1979 still supplied only about 4 percent of all funding for academic R&D expenditures.
- As in earlier years, the life sciences accounted for more than one-half of all academic R&D expenditures in 1979. The environmental sciences, however, grew at the most rapid rate during the 1977-79 period, more than 12 percent per year. The life sciences, engineering, and the mathematical/computer sciences all grew at rates of between 10 percent and 11 percent per year.
- Capital expenditures for S/E activities at universities and colleges fell at an average annual rate of 3 percent, or nearly 10 percent in constant dollars, between 1972 and 1979. In 1980, however, total capital expenditures rose 13 percent (nearly 5 percent in constant dollars). Although the drop in federally financed capital expenditures continued into 1980, funding for capital expenditures from other sources increased by 20 percent.

academic s/e personnel

- The 325,000 scientists and engineers employed in institutions of higher education in January 1980 represented a 3-percent per year increase over the number employed in 1978. This is almost identical to the average annual growth rate for the whole 1973-80 period. Full- and part-time employment grew at almost identical rates between 1978 and 1980, in marked contrast to the earlier years when part-time employment grew three times as fast as full-time employment (6 percent compared to 2 percent per year). Virtually all the 1978-80 increase in S/E employment took place in doctorate-granting institutions; the number of scientists and engineers employed in master's-granting institutions actually declined slightly.

- Life scientists made up the largest single group of academic S/E professionals throughout the 1973-80 period, accounting for about 40 percent of all S/E employment in each year. Between 1978 and 1980 the number of life scientists grew at an average annual rate of 4 percent, slightly above the 3-percent average for the 7-year period as a whole. Mathematical/computer scientists were the fastest-growing group for the entire period, however, increasing by nearly 5 percent per year, though between 1978 and 1980 the rate dropped to 4 percent per year. Engineers increased at a 3-percent average annual rate over the 7-year period, but by more than 4 percent per year between 1978 and 1980. The number of academically employed physical scientists rose at the slowest rate, less than 2 percent per year during the entire period, and by only 1 percent per year between 1978 and 1980.
- The 57,100 FTE scientists and engineers engaged in research and development in 1980 represented an average increase of only 1 percent per year over the number in 1978. This rate of growth was considerably lower than the nearly 5-percent-per-year growth in academic R&D expenditures during the same period, and when considered in conjunction with the 5-percent-per-year increase in graduate research assistants, it indicates an increasing tendency for universities to rely on support personnel for the conduct of research. The average annual growth in FTE's in other activities between 1978 and 1980 was 2 percent.

graduate s/e students

- In fall 1979, 375,000 students were enrolled in courses of study leading to graduate degrees in the sciences and engineering, up 2 percent per year since fall 1977. Preliminary data from the fall 1980 survey indicate another rise of nearly 3 percent between 1979 and 1980. These increases in S/E enrollment run counter to the trend in nonscience graduate enrollment, which fell by almost one-fourth during the 1975-79 period. The proportion of all graduate students enrolled in S/E programs at doctorate-granting institutions rose from 23 percent to 30 percent during those years.
- Growth of graduate student enrollment in various fields of science was near the overall 1977-79 average, mathematics/computer sciences and engineering being slightly above average, while the physical sciences were slightly below.
- Women made up 33 percent of the full-time S/E graduate students enrolled in doctorate-granting institutions in 1980, up from 25 percent in 1975. This represents an average annual growth of 8 percent per year (7 percent between 1979 and 1980). The number of women enrolled for graduate study in engineering increased by 17 percent per year during the 1975-80 period, compared with an average annual growth rate of 6 percent in the social sciences. Between 1979 and 1980, these growth rates were 14 percent and 6 percent, respectively.
- The number of foreign students enrolled in graduate programs grew by 8 percent per year between 1975 and 1980, and by 9 percent between 1979 and 1980. They accounted for an increasing proportion of full-time S/E graduate enrollment—20 percent in 1980, up from 16 percent in 1975. The largest number of foreigners were enrolled in engineering, where they comprised 42 percent of the engineering total. Foreigners also accounted for 30 percent of all graduate students enrolled in the mathematical/computer sciences.

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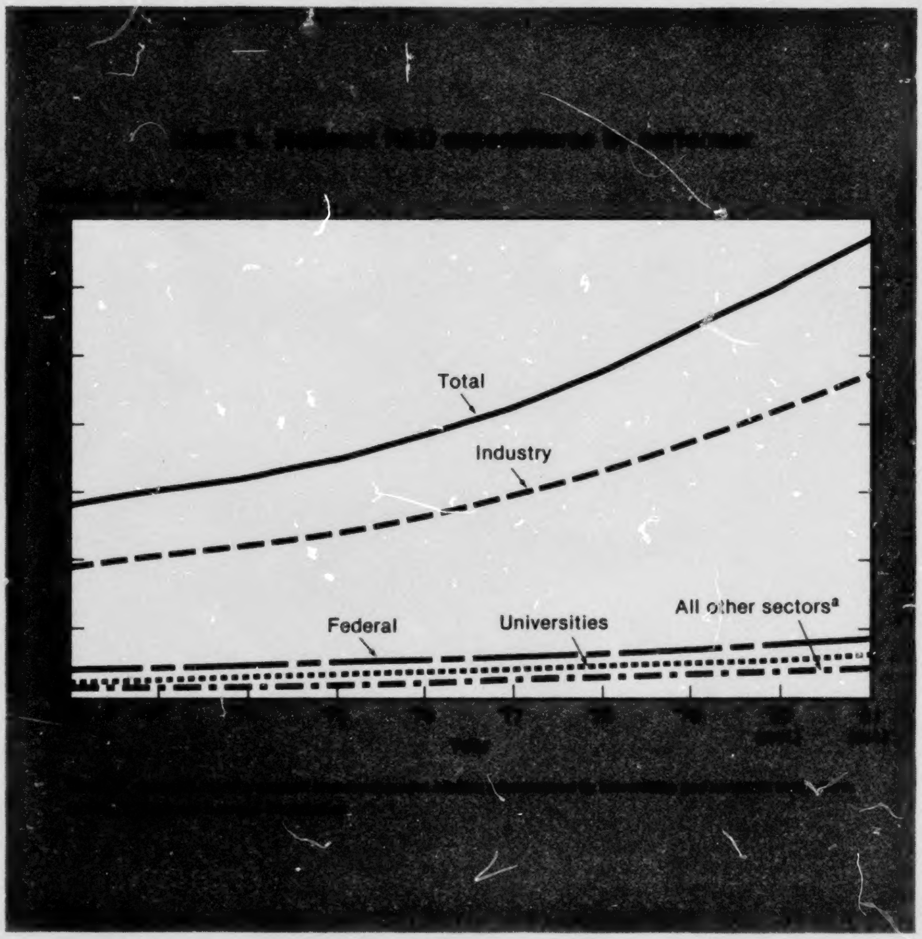
part 1.

trends in academic r&d expenditures

general characteristics, 1972-81

R&D expenditures data analyzed in detail in this report are derived from annual NSF surveys of S/E activities at all universities and colleges with S/E graduate programs. The surveys cover all institutions in FY's 1972 through 1977 and 1979 and only doctorate-granting institutions in 1978. Estimated data for 1980 are based on early returns from the subsequent survey cycle, and 1981 estimates have been derived from the annual NSF report analyzing national patterns of R&D resources.[1] According to these estimates, academic institutions' performance of research and development accounted for about $6 billion, or 10 percent of total allocations for research and development in the United States in 1980, and the proportion in 1981 is expected to be about the same, or $6.3 billion out of $69.1 billion (table B-1 and chart 1).



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[1] National Science Foundation, *National Patterns of Science and Technology Resources, 1981* (NSF 81-311) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1981).

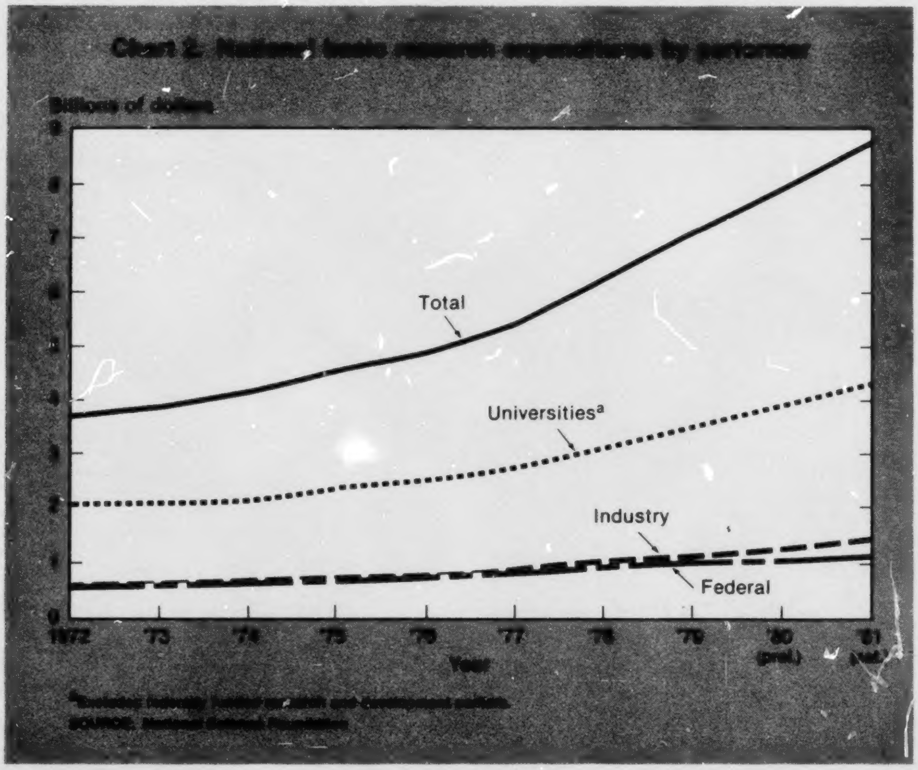
An examination of the role of academic institutions in the performance of all types of research and development, however, tends to obscure the significant involvement of universities and colleges in the performance of basic research. It is estimated that academic institutions' performance accounted for about one-half of every dollar allocated to basic research in the United States in 1980 (table B-2 and chart 2). University-administered federally funded research and development centers (FFRDC's) accounted for an additional 10 percent of the total.

These amounts understate the total R&D performance of the academic sector of the economy, since data collected in the annual NSF university and college expenditure surveys are limited to separately budgeted R&D expenditures. The accounting procedures adopted by most universities and colleges combine the costs of instruction and departmental research because of the inherent difficulty in measuring them separately. Amounts spent on departmental research alone, therefore, cannot be identified.

Although the growth in academic R&D expenditures averaged 11 percent per year between 1972 and 1980, or 3 percent per year in real dollars, the rates of increase accelerated in the late seventies and reached 15 percent between 1979 and 1980, or 6 percent in constant dollars. On the basis of estimates prepared for *National Patterns of Science and Technology Resources*, an abrupt shift is expected for 1981, down to 6 percent in current dollars, equivalent to a decline of almost 4 percent in constant-dollar terms.

Academic expenditures for basic research grew during the 1972-80 period at an average annual rate of 9 percent (or 2 percent in constant dollars), somewhat less than the 11-percent average annual growth in industrial basic research funding and the 10-percent average annual growth for all basic research expenditures in the United States. Preliminary data show a 14-percent growth in academic expenditures for basic research between 1979 and 1980, but only a 6-percent growth estimated for 1981. In constant-dollar terms, this translates to a rise of 5 percent followed by a 4-percent decline.

Chart 2. National basic research expenditures by performer



[a]Excludes federally funded research and development centers.

SOURCE: National Science Foundation

detailed characteristics, 1972-79

During the 7-year period 1972 through 1979 examined in detail in this section of the report, expenditures for basic research by institutions of higher education rose from $2.0 billion to $3.6 billion, for an average annual growth of 8 percent. This growth was almost entirely erased by the effects of inflation; in real terms the increase averaged 1 percent per year.[2] University and college expenditures for applied research and development grew during the same period at an average annual rate of 15 percent (7 percent in real dollars), reflecting a shift in emphasis toward shorter term objectives during the period of budgetary constraints (table B-3 and chart 3). Since there is an inherent uncertainty of success accompanying any investment in basic research, it is becoming evident that there is in a time of rising fiscal conservatism an increasing reluctance on the part of institutions to concentrate significant funding in what are often viewed as high-risk ventures. The amount allocated to basic research, which represented 77 percent of all academic R&D expenditures in 1972, fell to a low of 68 percent in 1976 and has since remained stable at 69 percent.

Although the Federal Government remains the largest single source of funding for academic research and development, the 66-percent share of all academic R&D expenditures funded by the Federal Government in 1979 marks a steady decline from the 69-percent peak funded from Federal sources in 1973.

During that 7-year period, the Federal Government increased its funding for academic research and development by 91 percent. Funding by nonprofit organizations to universities and colleges is estimated to have doubled. Funding from industrial organizations rose by 160 percent, but industry still remained

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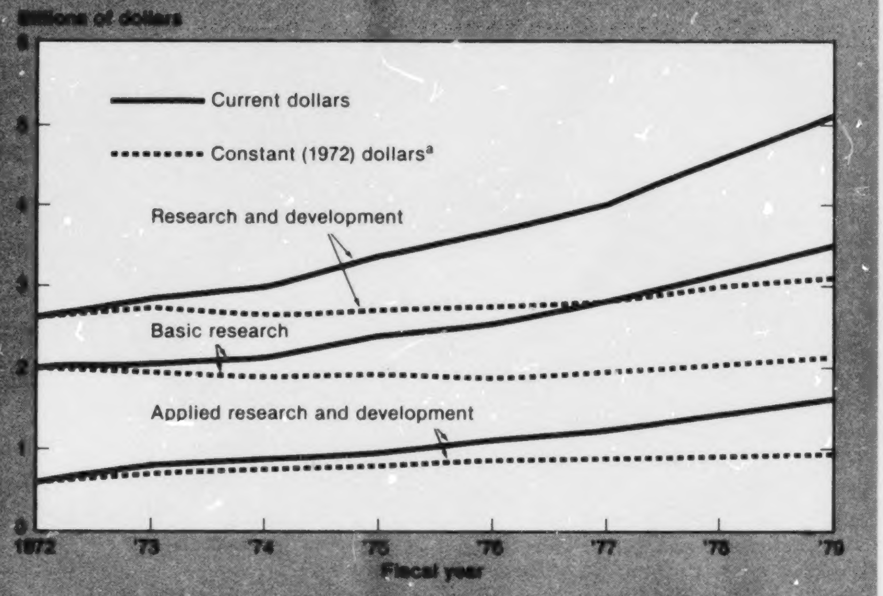
[2] In the absence of a reliable R&D cost index, the gross national product (GNP) implicit price deflator was used to convert current dollars into constant 1972 dollars. The GNP deflator can only indicate approximate changes in the costs of R&D performance.

Chart 3. R&D expenditures at universities and colleges by character of work



[a]Based on GNP implicit price deflator.
SOURCE: National Science Foundation

the smallest source of academic R&D funds throughout the period, never accounting for more than 4 percent of the total.

During the seventies there was a slight change in the distribution of academic R&D expenditures among fields of science and engineering. The life sciences, which accounted for one-half of the 1972 total, increased this relative lead over the remaining fields to 54 percent in 1979. Engineering and the environmental sciences also grew slightly as proportions of the total, while the physical sciences, social sciences, and psychology accounted for smaller shares in 1979 than in 1972. These changes in funding patterns will be examined in greater detail in the next two subsections.

the federal role

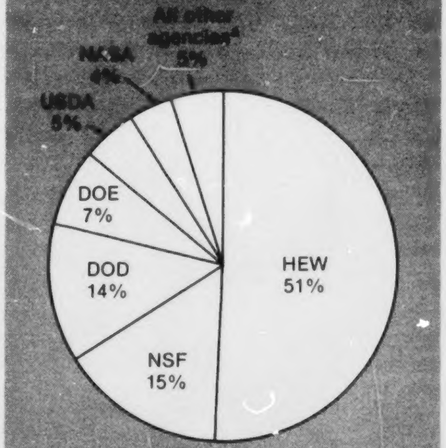
The Federal Government, the chief supporter of academic research and development in recent years, began financing academic R&D activities during the last century with the funding of agricultural research at land-grant colleges. It was not until World War II that Federal funds became significant in the support of academic research and development. At that time the immediate need for sophisticated weaponry quickly raised the War and Navy Departments to leading positions among the Federal supporters of academic research; subsequently, the gradual shift in national priorities from defense to health needs brought the Department of Health, Education, and Welfare (HEW) into the leading position it maintained throughout the period under consideration.

In annual NSF surveys of Federal agencies, the latest of which covers FY 1979 obligations, HEW has reported about one-half, or more, of all Federal funding for academic research and development since 1974. NSF ranked second throughout the 1974-79 period, accounting for between 15 percent and 18 percent of the academic R&D total, followed by the Department of Defense (DOD) which reported between 9 percent and 14 percent of the total. In all, six agencies—these three plus the Departments of Agriculture and Energy (DOE), and the National Aeronautical and Space Administration (NASA)—account for about 95 cents of every Federal dollar allocated to academic R&D activities (table B-4 and chart 4).[3]

Federally funded academic R&D expenditures grew at a slower rate during the 1972-79 period than did nonfederally financed research and development in academic institutions (table B-5 and chart 5). In constant dollars, the average annual rate of growth in federally financed research and development over the entire period was only 2 percent.

The growth rate of nonfederally financed academic R&D activities varied noticeably from that of Federal funding. Between 1972 and 1973 real growth in nonfederally financed research and development was 3 percent, only one-half that of Federal funding; during the 1973-77 period, however, the real growth rate was 2 percent, and during the 1977-79 period it was more than 6

Chart 4. Federal obligations for research and development at universities and colleges by sponsoring agency: FY 1979



Total: $3.6 billion

[a]Commerce, EPA, HUD, Interior, AID, Labor, NRC, and DOT.
SOURCE: National Science Foundation

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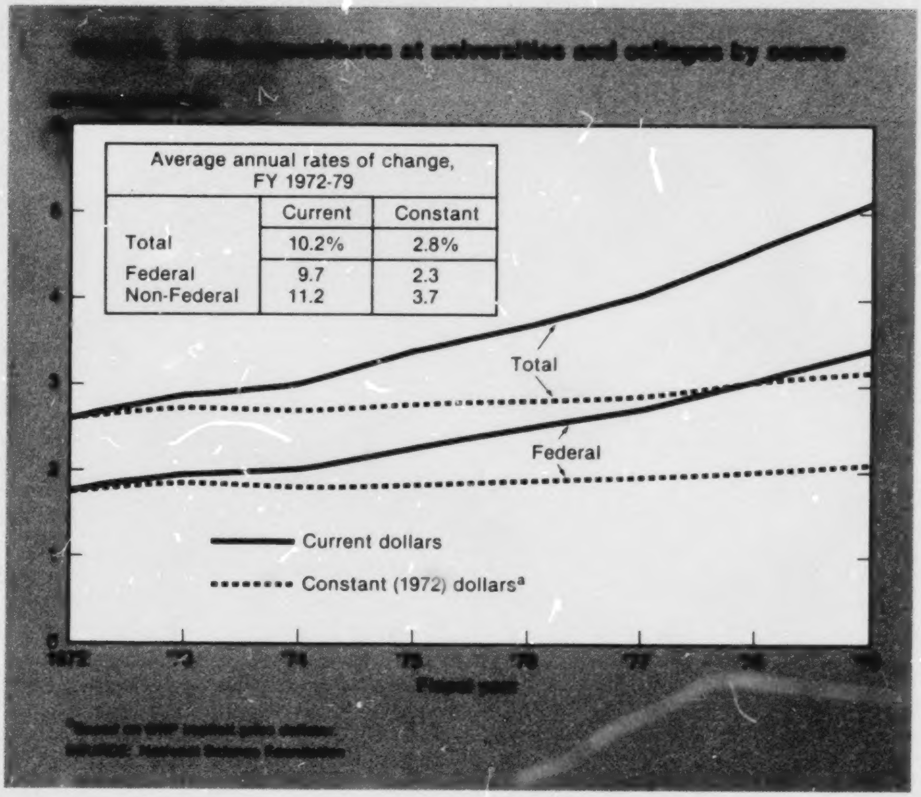
[3] National Science Foundation, *Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1979*, A Report to the President and Congress (NSF 81-308) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1981).



[illegible] expenditures at universities and colleges by source

Average annual rates of change, FY 1972-79	Current	Constant
Total	10.2%	2.8%
Federal	9.7	2.3
Non-Federal	11.2	3.7

[illegible]

SOURCE: National Science Foundation

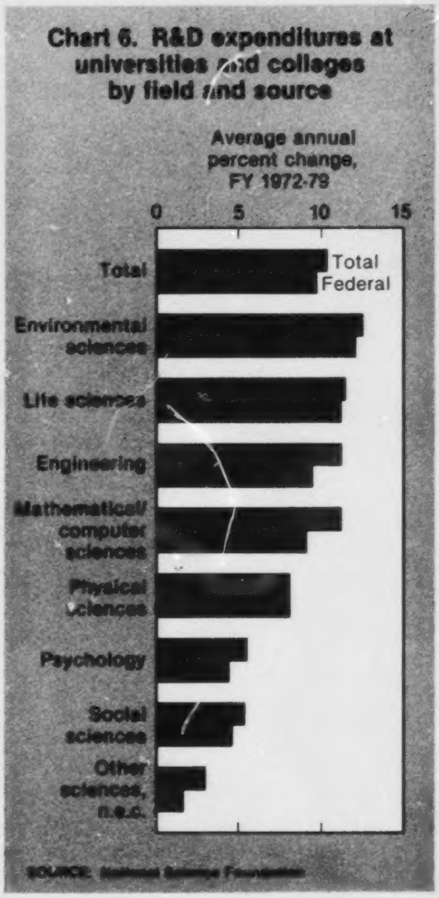


Chart 6. R&D expenditures at universities and colleges by field and source

SOURCE: National Science Foundation

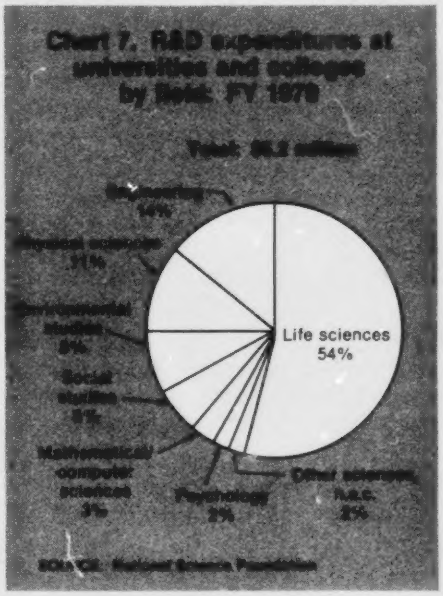


Chart 7. R&D expenditures at universities and colleges by field: FY 1979

SOURCE: National Science Foundation

percent. Real-dollar academic R&D expenditures declined in only one year (1974) and over the entire period maintained an average annual growth rate of 3 percent.

"Institutions' own funds"—a category which includes unrestricted gifts and grants—was the second largest source of R&D expenditures, ranging between 11 percent and 14 percent of the total between 1972 and 1979. State and local governments have supplied about 10 percent of all academic R&D funding since 1972. As indicated earlier, industry was the fastest growing source of academic R&D expenditures, but because of the relatively small amounts involved this did not affect the overall distribution significantly.

fields of science/ engineering

All major S/E fields shared in the 1972-79 growth in academic R&D expenditures in current dollars; however, when the effects of inflation were taken into account, the growth was limited to the so-called "hard" sciences—the life sciences, environmental sciences, and the physical sciences—and the mathematical/computer sciences and engineering. The most rapid growth occurred in academic funding for the environmental sciences—up 12 percent per year in current dollars. The annual R&D growth rates for the mathematical/computer sciences and the life sciences and engineering were almost identical at 11 percent per year, while the physical sciences showed an 8-percent-per-year growth in funding. The social sciences and psychology each grew by 5 percent per year (tables B-6 and B-7 and chart 6).

The life sciences retained their lead over the other broad fields and accounted for 54 percent of the total in 1979. The other fields likewise generally retained their relative rankings throughout the period. Engineering and the environmental sciences also increased their shares of the total slightly, while psychology and the social sciences accounted for smaller proportions in 1979 than in 1972 (chart 7).

The physical sciences ranked first in terms of the proportion of total funding received from Federal sources, and the social sciences last (chart 8). To some extent, this may result from the far higher equipment costs involved in research in the physical sciences, but it is also a reflection of the relative priorities of the major funding agencies,

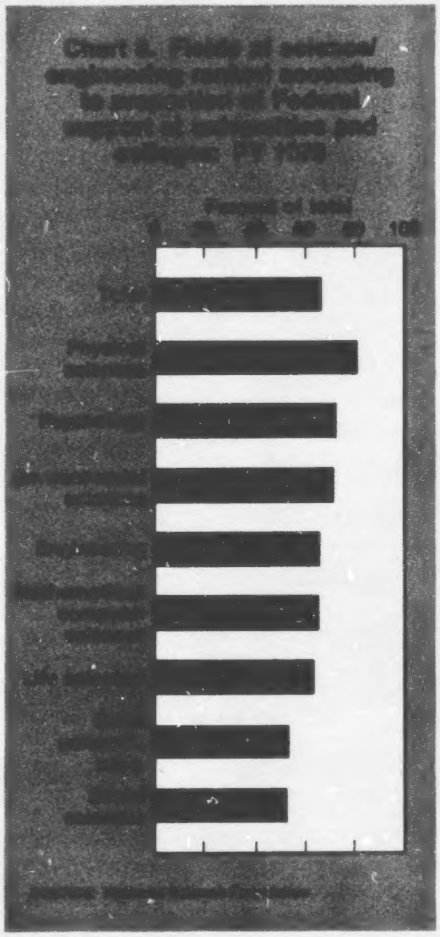


Chart 8. Fields of science/engineering ranked according to proportion of Federal support at universities and colleges: FY 1979

SOURCE: National Science Foundation

especially mission-oriented agencies such as HEW, DOD, and NASA.

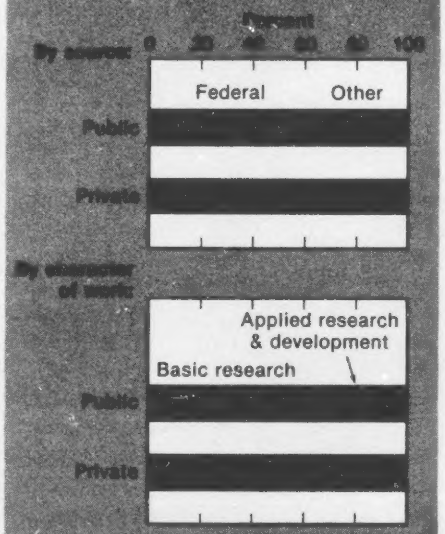
institutional control

Although private universities and colleges outnumbered those under public control in 1979—1,702 to 1,488[4]—the latter accounted for 65 percent of all federally financed R&D expenditures. The dollar gap between public and private institutions in terms of R&D expenditures has widened during the 7-year period under consideration. In 1972 public universities accounted for 62 percent of all academic R&D expenditures. Since that time the proportion of the total spent by public institutions has hovered around 65 percent. While the R&D expenditures of publicly controlled institutions increased at an average annual rate of 11 percent between 1972 and 1979 (4 percent in constant dollars), the comparable rate for private institutions was 9 percent, or 1 percent in constant dollars (table B-8 and chart 9).

The discrepancy between the relative numbers of public and private institutions and the proportion of total R&D expenditures accounted for by each group is to a large extent a function of the number of major research institutions within each group. The publicly controlled group included a higher number of institutions in the survey of R&D expenditures than did the group under private control: 22 percent of the public institutions reported R&D expenditures, but only 14 percent of the private institutions did so. Among the institutions surveyed, those granting the doctorate degree accounted for 98 percent of the R&D expenditures, and 59 percent of these doctorate-granting institutions were under public control.

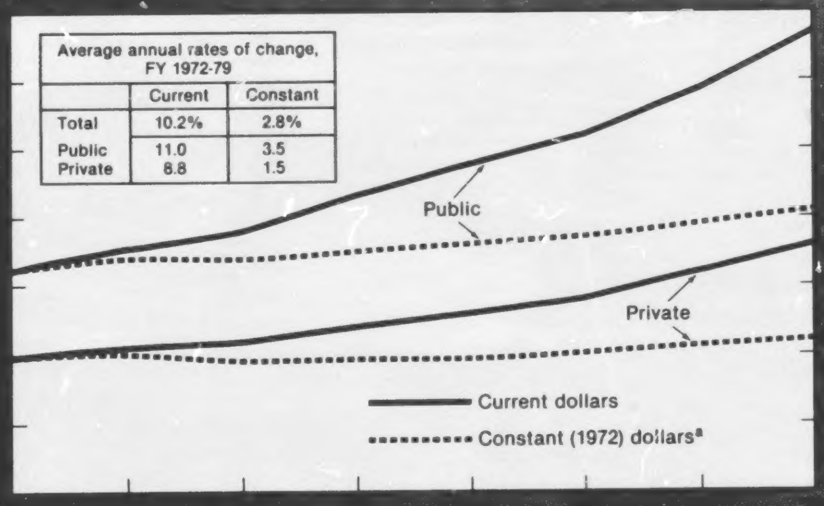
The Federal Government supported a lower proportion of all R&D expenditures at publicly controlled universities and colleges than at those under private control (61 percent compared to 76 percent). Variations are discernible in the distribution of R&D expenditures by character of work. Among public institutions, 63 percent of the total was allocated to basic research, while private institutions allocated a much higher proportion—80 percent (table B-9 and chart 10).

Chart 10. R&D expenditures at universities and colleges by institutional control, source, and character of work: FY 1979



SOURCE: National Science Foundation

Chart 9. R&D expenditures of universities and colleges by institutional control



Average annual rates of change, FY 1972-79	Current	Constant
Total	10.2%	2.8%
Public	11.0	3.5
Private	8.8	1.5

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[4] Department of Education, National Center for Education Statistics, *Education Directory, 1979-80* (NCES 80-348) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office), p. 28.

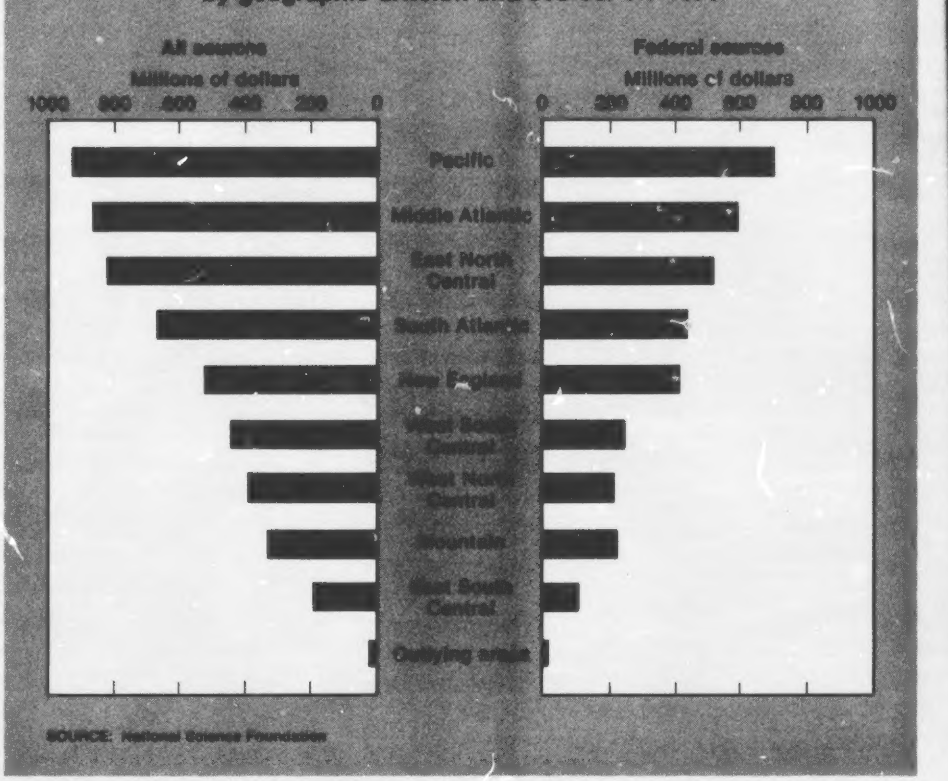
The type of institutional control made little difference in the distribution among fields of research. Only in the physical and environmental sciences were there slight differences between the two groups (4 percentage points or less).

geographic distribution

All geographic divisions of the country participated in the growth in academic R&D expenditures during the 1972-79 period, with much higher rates of growth in the "sun belt" States of the South and West than in the more northerly regions. This situation results largely from recent shifts in population and economic activity in general. R&D expenditures of institutions in the West South Central States increased at an average annual rate of 14 percent while those of institutions in the East South Central Division grew by 12 percent per year. At the other end of the spectrum, the R&D expenditures of institutions in the Middle Atlantic States grew by less than 9 percent per year, and the 7-percent annual growth rate of institutions in the outlying areas was barely sufficient to keep pace with inflation (table B-10 and chart 11). The West South Central States also showed the highest growth rate in terms of federally funded R&D expenditures, 13 percent, and the West North Central and Middle Atlantic States the lowest, 8 percent (table B-11).

A State-by-State examination of academic R&D expenditures points up the concentration of R&D expenditures more clearly. California led the Nation, as it has throughout the 1972-79 period, in both total and federally financed R&D expenditures, followed by New York, Massachusetts, and Texas (chart 12). It is noteworthy that each of these States includes at least one locality with a high concentration of leading universities in terms of both staff and facilities. In California, for example, both the San Francisco and Los Angeles Standard Metropolitan Statistical Areas (SMSA's) have several large universities, as did the SMSA's in the other leading States—New York City, Boston, and Dallas-Fort Worth.

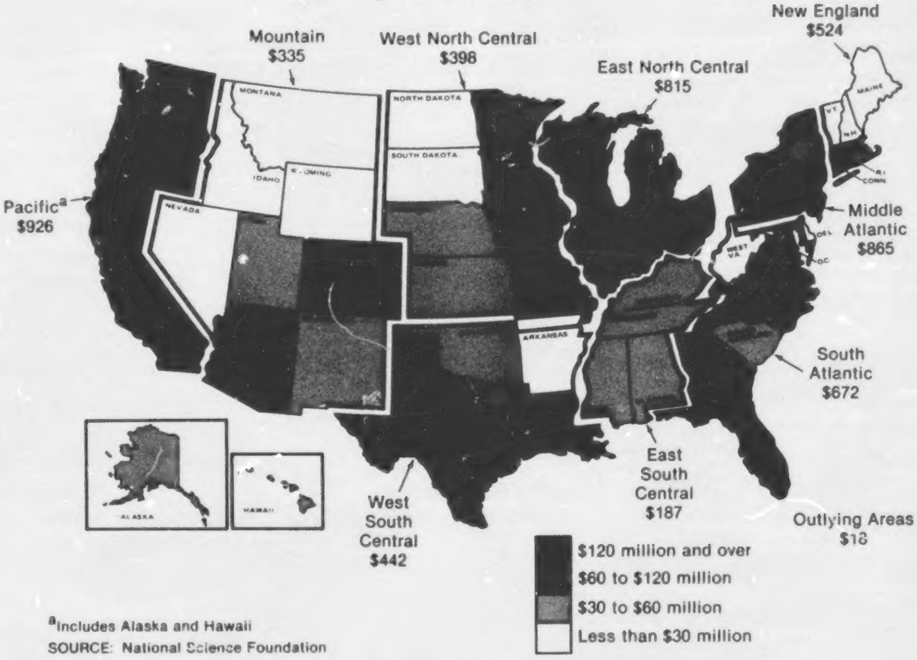
Chart 11. R&D expenditures at universities and colleges by geographic division and source: FY 1979



SOURCE: National Science Foundation

Chart 12. R&D expenditures at universities and colleges by State: FY 1979

[Millions of dollars]



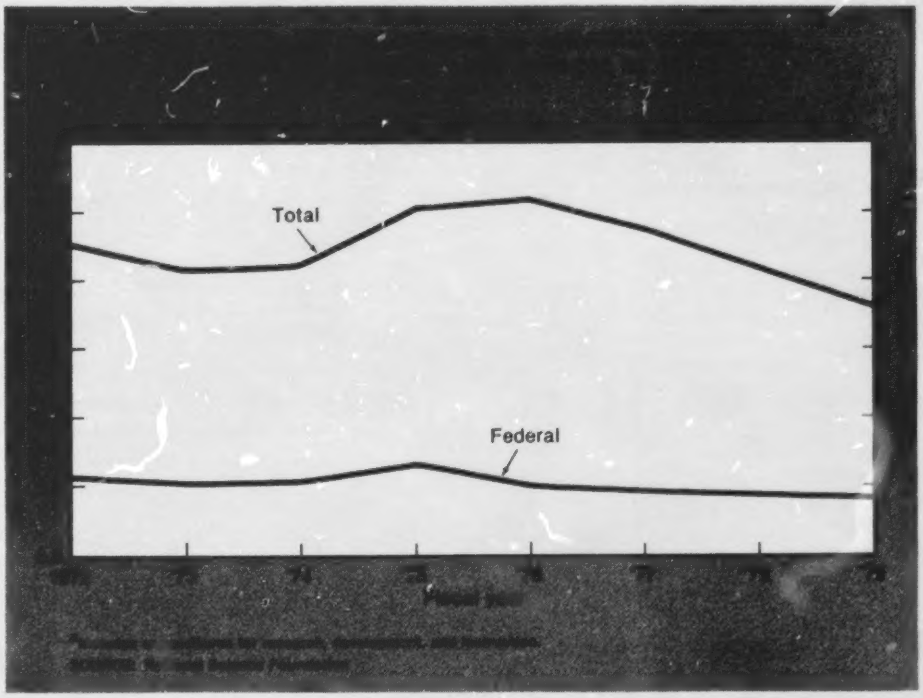
[a] Includes Alaska and Hawaii

SOURCE: National Science Foundation

capital expenditures for research, development, and instruction

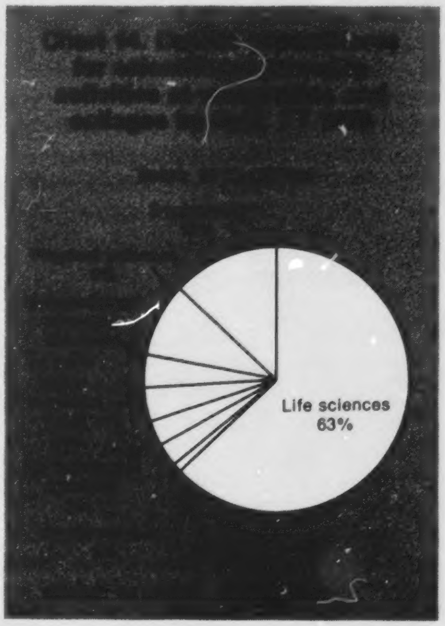
In addition to the $5.2 billion from current operating funds which institutions of higher education allocated to R&D activities, another $730 million went into capital expenditures for S/E research, development, and instruction—the smallest amount of any year since 1972. The 1979 total represented only 70 percent of the 1976 peak, for an average annual real-dollar decline of 8 percent.

The Federal Government was the source of 23 percent of the 1979 capital expenditures reported, down from 27 percent of the 1973 total (table B-12 and chart 13). During the midsixties, support of academic research facilities and instrumentation grew at an unprecedented pace as a number of agencies implemented or expanded programs for the support of R&D plant in response to initiatives on the part of the Administration. During the seventies, however, investment in R&D plant declined sharply. Concern over growing difficulties in maintaining and replacing obsolete S/E equipment and instrumentation resulted from a number of independent and governmental studies.[5]



Academic R&D plant support by the Federal Government in 1979 remained at only one-fourth (about one-tenth in real dollars) of its 1965 amount.[6]

The distribution of capital expenditures by field was not substantially different from that of current R&D expenditures. The life sciences again received by far the largest amount, 63 percent of the total. Engineering ranked second with 13 percent, followed by the physical sciences with 9 percent (chart 14).



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[5] For examples, see Association of American Universities, *The Scientific Instrumentation Needs of Research Universities, A Report to the National Science Foundation* (Washington, D.C., June 1980), pp. 21-23; and Frank J. Atelsek and Irene L. Gomberg, *Shared Use of Scientific Equipment at Colleges and Universities, Fall 1978,* Higher Education Panel Report Number 44 (Washington, D.C.: American Council on Education, November 1979), p. 1.

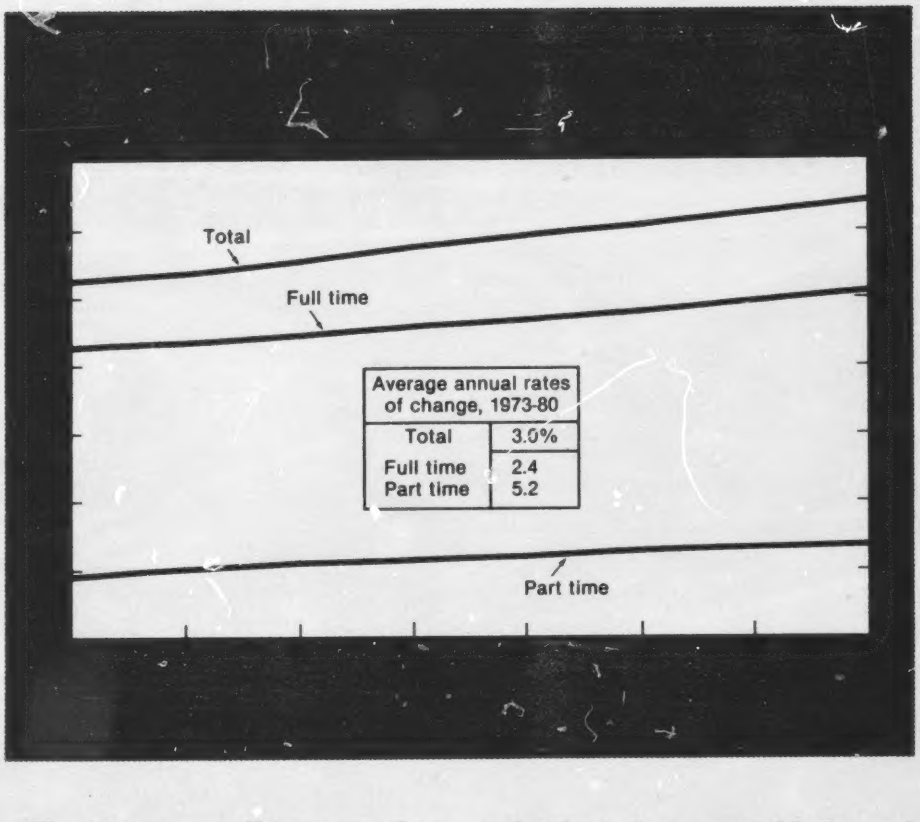
[6] National Science Foundation, *Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1979, op. cit.*

part 2.

trends in academic s/e employment

general characteristics, 1973-80

During the period January 1978 through January 1980, employment of scientists and engineers at universities and colleges rose by an average of 3 percent per year, the same rate of growth as for the entire 1973-80 period.[7] Full-time S/E professionals, who represented about four-fifths of all academic S/E employment throughout the 7-year period, increased their ranks by an annual average of over 2 percent. Part-time employment grew, however, at more than twice the full-time rate, but its share of total academic S/E employment rose by only 3 percentage points, from 18 percent to 21 percent during this period (table B-14 and chart 15).



The 1973-80 overall increase of 23 percent in the number of scientists and engineers employed in academia was reflected in all disciplines, at rates ranging from 45 percent in the mathematical/computer sciences to 11 percent in the physical sciences (table B-14 and chart 16). This growth in academic employment occurred despite a net decline of 7 percent in the total number of doctorate S/E degrees awarded annually during the comparable period

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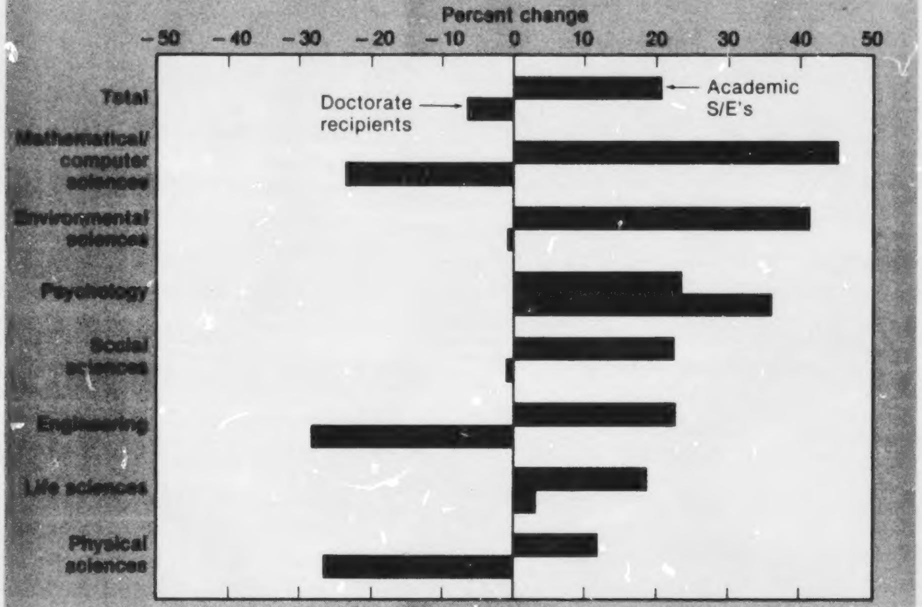
[7] Based on the National Science Foundation's Survey of Scientific and Engineering Personnel at Universities and Colleges, annual series. According to the definition used in NSF's survey of academic S/E employment, professional employees of academic institutions are those working at a level requiring at least a bachelor's degree. Professional personnel include S/E faculty members, postdoctorates, and all other employees in S/E disciplines holding a bachelor's degree or the equivalent, such as research administrators and systems analysts in computer centers. Note that data for January 1979 were collected from doctorate-granting institutions only.

Chart 16. Doctorate recipients and employment of scientists and engineers at universities and colleges by field: 1972-79 and 1973-80[a]



[a] Data on doctorate recipients represent June 1972 and June 1979; data on employment of scientists and engineers represent January 1973 and January 1980.

SOURCE: National Science Foundation

(table B-15).[8] The total number of doctorates awarded in S/E disciplines in the academic year ending June 1979 exceeded the number awarded in the year ending June 1972 in only two fields, psychology and the life sciences. The declining number of doctorates granted annually in some fields illustrates the comparative drawing power of industrial and other sectors of employment for bachelor's- and master's-degree holders, especially in the computer and physical sciences and engineering.

Throughout the 1973-80 period, the largest group of academic scientists and engineers has been those in the life sciences—about 40 percent of the total—followed by the social sciences with about 17 percent. Mathematical/computer scientists, engineers, and physical scientists each comprised about 10 percent of the total. The predominance of the life sciences is consistent with the preponderance of total R&D expenditures allocated to this area, but this relationship does not hold in the case of the social sciences: R&D funding for the social sciences made up only 6 percent of all R&D expenditures in 1979. In comparison with the number of academic personnel employed in this area, this level of R&D funding is traceable primarily to the extremely low equipment costs generally associated with social science research.

The life sciences, in addition to accounting for about two out of every five scientists and engineers employed in universities and colleges, represented over one-third of the net growth in the employment of academic scientists and engineers in the 1973-80 period. Life scientists, mathematical/computer scientists, and social scientists together accounted for nearly three-fourths of the total net growth.

comparison of academic sector employment patterns with other sectors

There has been a discernible trend in the seventies toward a lower rate of growth of employment of scientists and engineers within the academic sector than within the industrial sector. Between 1976 and 1978, the number of S/E personnel in educational institutions grew by less than 3 percent compared to 7 percent in industry, and remained stable in the Federal Government and other sectors. In the 1974-76 period, however, employment of scientists and engineers grew by 9 percent in both the educational and Federal Government sectors, 8 percent in nonprofit organizations, and only 4 percent in the industrial sector.[9]

The sudden relative spurt in industrial S/E employment is partially the result of the postrecession economic recovery that occurred in the midseventies. The slower rate of academic hiring resulted in part from growing financial strains, largely brought on by projections of declines in future enrollment in universities and colleges. These enrollment declines, however, have yet to be significantly felt in S/E fields. In addition, academic employment of recent S/E graduates (those who earned bachelor's and master's degrees between 1976 and 1979) rose by only about 5 percent, but within the industrial sector S/E employment of recent graduates grew by over 20 percent.[10]

Within the S/E disciplines, the NSF study found that employment demand in all sectors was greatest for engineers and computer specialists.[11] Recent graduates in these S/E areas have tended to find more attractive employment opportunities within industry than within academic institutions. Of those students who attained bachelor's or master's degrees in 1977 in engineering, nearly five of every eight were employed as engineers in all sectors in 1979. Of those whose field of study was the computer sciences, almost two out of three persons who got master's degrees in 1977 and five out of six bachelor's recipients during that year were employed as computer specialists in 1979 (table B-18 and chart 17). The ability of industrial engineers and computer scientists to earn higher salaries than their academic

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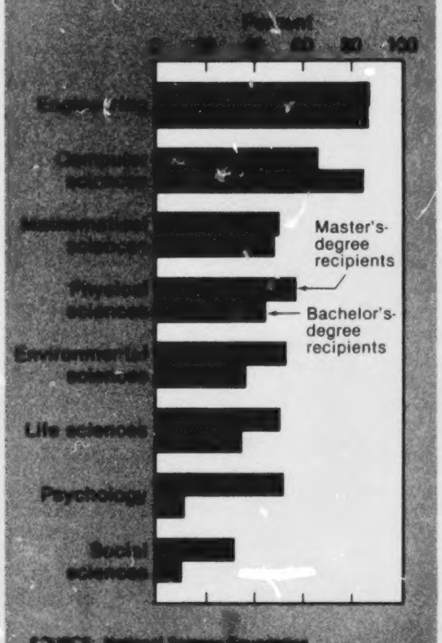
[8] Based on National Research Council's *Summary Reports. Doctorate Recipients from United States Universities*, annual series, June 1972 through June 1979, table 1.

[9] National Science Foundation, *U.S. Scientists and Engineers, 1978* (Detailed Statistical Tables) (NSF 80-304) (Washington, D.C., 1980), table 2, p. 5.

[10] National Science Foundation, *Employment Attributes of Recent Science and Engineering Graduates* (NSF 80-325) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1980), p. 9.

[11] *Ibid.*, tables A and B, pp. 15-16.

Chart 17. Proportion of 1977 bachelor's-degree and master's-degree recipients in science/engineering fields that were employed in those fields in 1979



SOURCE: National Science Foundation

counterparts is obviously a factor in the surge of industrial employment at the expense of academia. Of great importance, too, is that within the past few years industries have expanded their efforts in the performance of research by investing in more sophisticated research facilities and equipment during a period when maintenance of existing research plants and the acquisition of more modern equipment at universities was becoming increasingly difficult. University researchers have purchased most of their instrumentation with Federal funds, but the growth of Federal research support has failed to keep up with the rising costs of the most advanced instrumentation needed. Professionals in engineering and the computer sciences have traditionally been strongly influenced by a research climate that they see as most conducive to opportunity and innovation.[12]

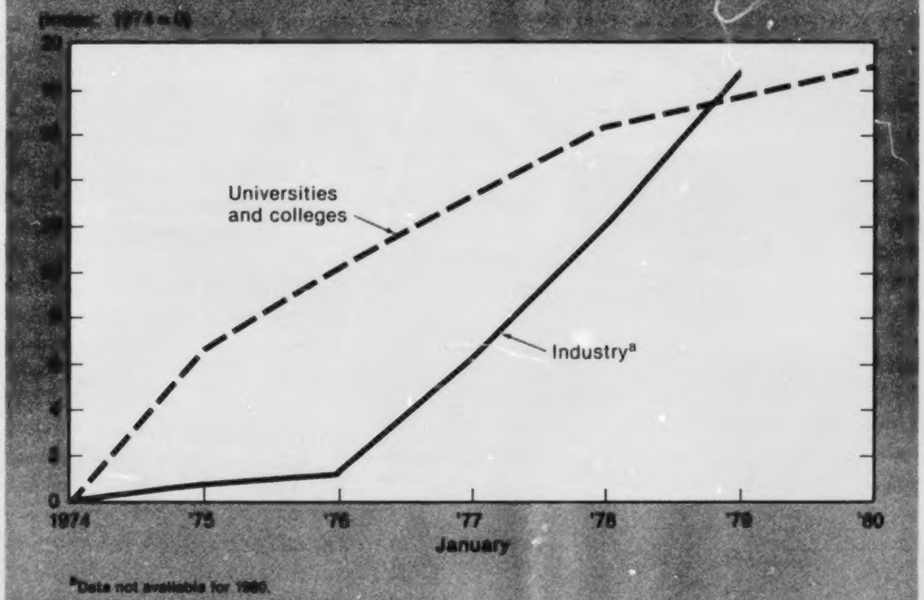
A National Academy of Sciences (NAS) report on academic engineering found that "...physical plants in which many departments of engineering are housed are deteriorating. Outdated laboratories are common, some of which fall far behind those in industry, government, or even foreign establishments. Faculty salaries are not competitive with those in industry and it is difficult to attract American graduate students.... While all university departments are seeking funding support, special conditions influence the economic health of engineering departments. Among these are the comparatively high cost of engineering education and the rapid pace of technology."[13]

For all S/E disciplines combined, the number of FTE R&D scientists and engineers employed at universities and colleges increased at an average annual rate of 3 percent between 1976 and 1978, compared to the 1974-76 growth rate of 5 percent per year. Within the industrial sector, however, FTE scientists and engineers have increased their numbers by a 5-percent average annual rate during the 1976-78 period, compared to less than 1 percent per year for the previous two years. Preliminary data for industrial employment in 1980 show that FTE's in research and development grew by 6 percent per year since 1978, while employment within academic institutions grew by only 2 percent since 1978[14] (table B-19 and chart 18).

employment status

The number of scientists and engineers employed part time increased at an average annual rate of 5 percent between 1973 and 1980, about double the growth rate of full-time S/E personnel. Both full- and part-time S/E employment grew at an average of 3 percent per year between 1978 and 1980, a significant departure from the earlier 1973-78 period when average growth in part-time employment was nearly triple the rate for full-timers.

Chart 18. Full-time-equivalent science/engineering personnel employed in research and development at universities and colleges and in industry



^a Data not available for 1980.

SOURCE: National Science Foundation

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[12] Association of American Universities, The Scientific Instrumentation Needs of Research Universities (Washington, D.C., June 980), pp. 12-14.

[13] National Academy of Engineering Task Force on Engineering Education of the National Academy of Sciences, *Issues in Engineering Education: A Framework for Analysis* (Washington, D.C., April 1980), pp. 12-16.

[14] National Science Foundation, *Academic Science: Scientists and Engineers, January 1980* (Detailed Statistical Tables) (NSF 81-307), table B-36, and *Research and Development in Industry, 1978* (Detailed Statistical Tables) (NSF 80-307), tables B-31 (Washington, D.C., 1980).

Between 1973 and 1978, approximately 17,000 additional part-time S/E employees were hired by academic institutions—an increase of 35 percent. An even higher number of full-timers were added, nearly 26,000, but their rate of growth was significantly lower, up 12 percent between 1973 and 1978. Between 1978 and 1980, however, fewer than 4,000 new part-timers were added to academic payrolls, a 5-percent increase, while nearly 14,000 new full-timers (a 6-percent increase) were added. This employment trend of academic scientists and engineers was consistent with that shown in a study of all full- and part-time instructional staff in all disciplines reported in all institutions of higher education by the National Center for Education Statistics (NCES). The study reported that the number of full-time staff members ranked as instructors or above rose by 14 percent between 1973 and 1978, while part-timers grew by 46 percent. Between 1978 and 1980, however, projected growth in the number of part-timers and full-timers was estimated at similar overall rates (3 percent and 2 percent, respectively).[15]

Full-time academic scientists and engineers represented 79 percent of the S/E employment total in 1980, the same proportion as in 1978 but down from 82 percent in 1973 (table B-14 and chart 19). The slight shift from full- to part-time status was felt in every S/E field except the life sciences, where between 1973 and 1980 full-time employment rose at an average annual rate that was three times the growth rate of part-time life scientists.

Over two-fifths of all full-time employees over the 7-year period were life scientists. Between 1978 and 1980, the number of full-time life scientists grew at a pace that averaged almost 10 times that for part-time life scientists, who comprised one-third of all part-time S/E employment. The life sciences were the predominant discipline in terms of Federal R&D support received, and to a lesser extent, in full-time graduate student enrollment (table B-37). Between 1978 and 1980, all S/E disciplines other than the life sciences, when combined, employed new part-timers by a ratio of 4 to 1 over full-timers (table B-14).

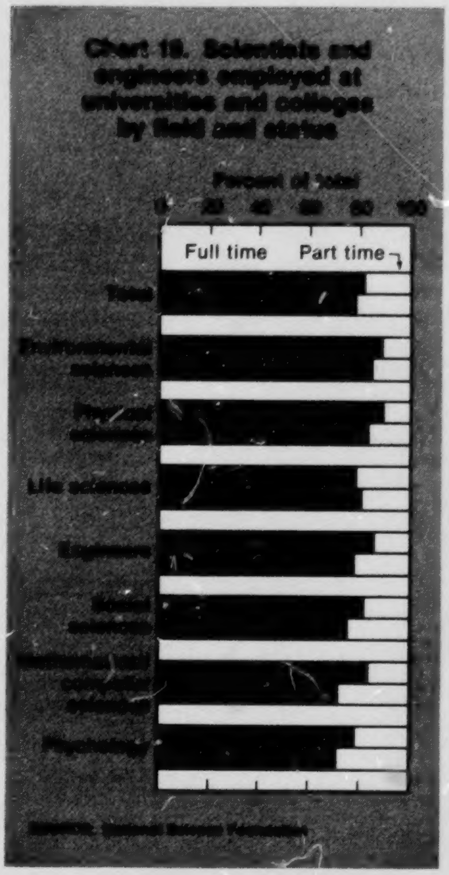
Chart 19. Scientists and engineers employed at universities and colleges by field and status

Source: National Science Foundation

The number of doctorate-holders employed full time in universities and colleges rose by an average of 4 percent per year between 1973 and 1978, compared to a growth of less than one-half of one percent per year for master's degree-holders and a decline of 2 percent per year for bachelor's degree-holders (table B-22). In the 1978-80 period, however, the annual growth rate for doctorate-holders slowed to 2 percent while master's-holders also increased 2 percent annually and bachelor's degree-holders went up by 10 percent.

type of activity

The FTE number of R&D scientists and engineers employed at universities and colleges increased by a total of 22 percent between January 1973 and January 1980, accompanied by an overall growth of 20 percent in the number of FTE's engaged in other S/E activities (table B-17).[16] The rise in R&D employment is directly linked to a heavy emphasis on R&D spending at academic institutions, up 21 percent in real dollars between FY 1972 and 1979 (table B-5). The annual growth rate in R&D FTE's was greater on the average, however, between 1973 and 1978 (3 percent) than between 1978 and 1980 (1 percent), attributable, perhaps, to a rapid rise in utilization of graduate research assistants on R&D projects in the later period (table B-32).

A study by the National Commission on Research predicted fewer opportunities for new faculty appointments in research universities in the next two decades because the number of S/E graduate students is expected to decline. Recent baccalaureate recipients are finding that S/E careers in business and industry are becoming more challenging and rewarding while graduate study is becoming more expensive and harder to finance. As a result, the Nation may not have access to enough qualified academic instructors and researchers. The Commission's study stated that "...These prospects seem especially grave in the sciences and engineering where, for other reasons as well, there has been growing apprehension that American science and technology will not continue to be as forward as they have been." The study found that while academic research remains substantial and of high quality, the continuation of such research is largely dependent on uncertain Federal support because institutions' own funds, endowment income, and State appropriations are sources that are unlikely to be significantly expanded.

The Commission further suggested that "...The ideal combination of instruction and research occurs as a graduate student works closely with an accomplished scientist on a research project of importance. In some fields, however, this ideal is no longer so often achieved. That is because of the increased scale of university research projects and because the equipment needed for some advanced research is not available in universities." The study recommended stronger bonds between university and FFRDC research, especially because of the prediction that there will be more and larger FFRDC's and that they will play an increasingly prominent role in the Nation's research effort.[17]

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[15] Department of Education, National Center for Education Statistics, *Projections of Education Statistics to 1988-89* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, April 1980), table 33, p. 100.

[16] Beginning in 1979, the personnel survey questionnaire requested data on type of activity only in terms of FTE involvement, since this basis of measurement provides a more accurate picture of a scientists or engineer's total activity than did the "primarily employed" concept used in the survey in earlier years. Only data on total and R&D FTE's were requested; therefore separate data on teaching and "other activities" are no longer available.

type of institution

Doctorate-level institutions employed about two-thirds of all academic scientists and engineers in 1980. Between 1973 and 1980, nearly three-fourths of the net growth of 60,000 academic scientists and engineers occurred in doctorate institutions, for a 3-percent average annual rate of growth (table B-16 and chart 20). Although doctorate-granting institutions represent only about one-eighth of the total number of the Nation's academic institutions, their continued dominance in attracting scientists and engineers is a result of their ability to draw financial support from a number of sources, especially the Federal Government, State and local governments, and from endowment support. An NSF-sponsored study by the National Center for Higher Education Management Systems (NCHEMS) found that "...the leading 100 research universities showed an average reliance on Federal grants and contracts for 20-35 percent of their funds."[18] This is a much higher proportion than at other institutions during the period studied (1975-79).

A slightly higher rate of S/E employment growth occurred during the 1973-80 period at both master's-granting institutions and at 2-year and nonscience-degree-granting institutions (4 percent). Master's-granting institutions accounted for 15 percent of the 7-year net growth in academic S/E employment, reaching a total of 37,400 employees in 1980, a slight decline (1,300 persons) from 1978. Bachelor's-granting institutions recorded a decline in hiring (less than 1 percent per year) during the 1973-80 period.

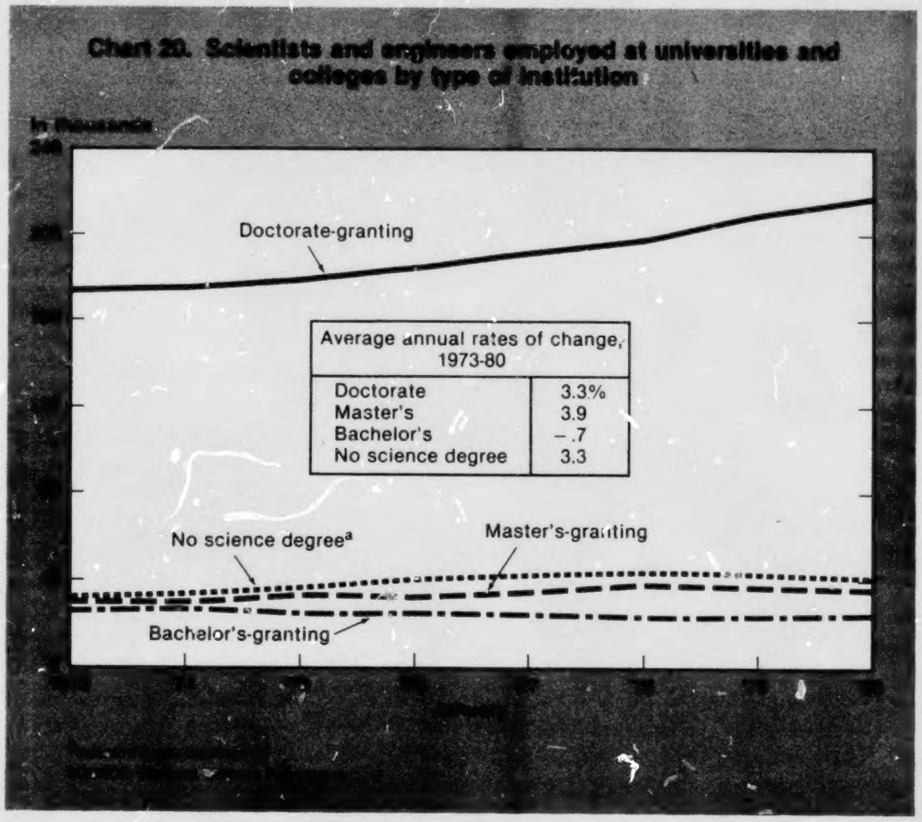
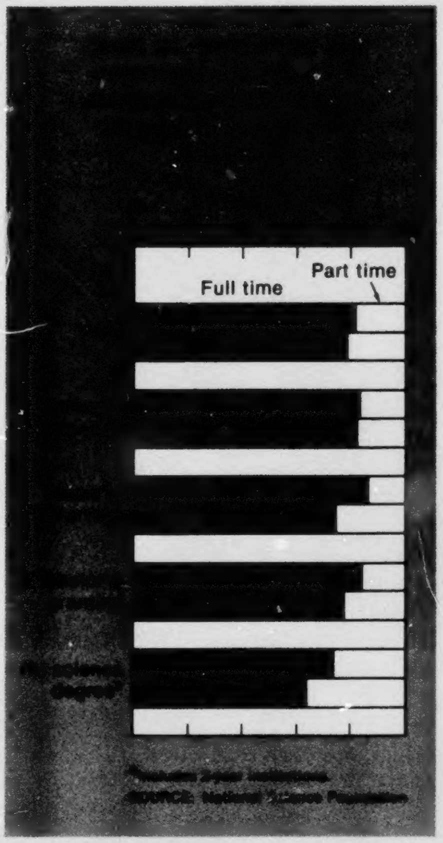


Chart 20. Scientists and engineers employed at universities and colleges by type of institution

Average annual rates of change, 1973-80	
Doctorate	3.3%
Master's	3.9
Bachelor's	–.7
No science degree	3.3

Between 1978 and 1980, however, virtually all growth in academic S/E employment occurred at doctorate-granting institutions, a striking indication of the vitality of these institutions compared to all other institutions in this era of increasingly tight resources in academe.

The ratio of full- to part-time scientists and engineers has changed somewhat between 1973 and 1980, particularly at those institutions that grant master's degrees and at nonscience degree-granting institutions (table B-16 and chart 21). The sharp rise in the proportion of part-time employment in these institutions indicates a strong trend towards hiring temporary, nontenure track employees on multiple assignments. In a recent article in *Change* magazine, it was suggested that "...part-timers provide an attractive option. That they can be obtained at a lower cost than other faculty is fairly apparent. Whether they should be is debatable. It seems likely that some institutions would find it necessary to cut back their course offerings severely, if not close altogether, if denied the use of part-time faculty. By



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[17] National Commission on Research, *Research Personnel: An Essay on Policy* (Washington, D.C., April 1980), pp. 3, 6, 8, 9, 11.

[18] National Center for Higher Education Management Systems, *Financing at the Leading 100 Research Universities*, draft of *Executive Summary* (Boulder, Colorado, April 1981).

saving on fringe benefits and by paying lower salaries, these institutions reduce their instructional costs."[19] The study added that "...most administrators have been exposed to the dire predictions of the future of academe. Administrators at schools experiencing temporary enrollment surges are loathe to tenure-in faculty since they may find themselves with a surplus when the long-awaited cataclysm arrives."

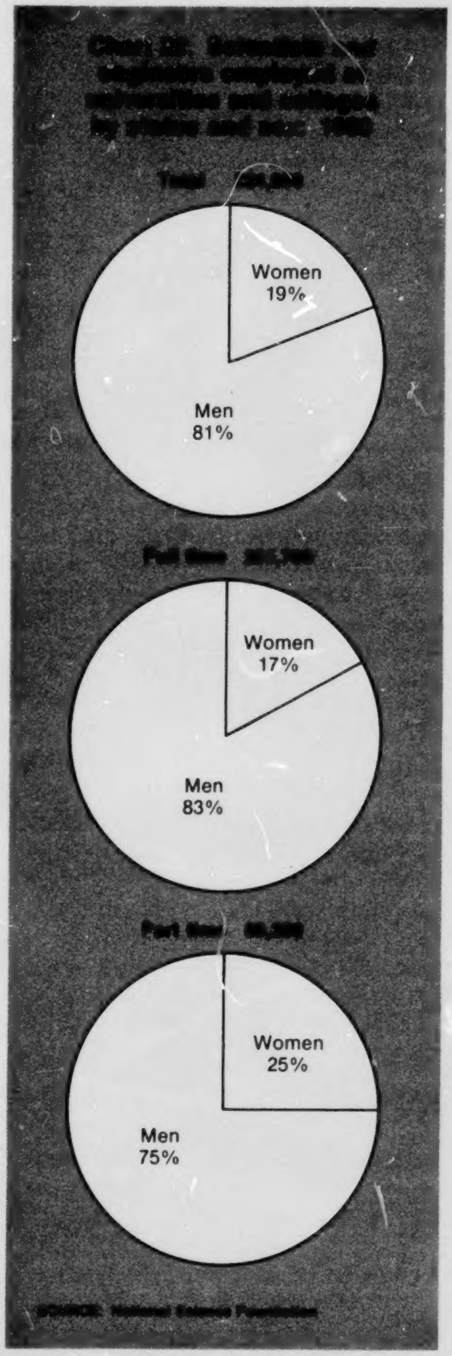
Between 1978 and 1980, only about one-fourth of all nondoctorate-granting institutions showed full-time employment growth but two-fifths reported part-time employment growth. Over two-thirds of all doctorate-granting institutions in 1978, however, reported growth in full-time S/E employment in 1980 and over three-fifths showed increased part-time employment. In 1980, doctorate-granting institutions employed 71 percent of all full-time scientists and engineers and 55 percent of all part-timers (table B-16).

The leading 100 institutions in terms of total S/E employment in 1980 (about 3 percent of all universities and colleges in the country) employed nearly one-half of all academic scientists and engineers and enrolled a similar proportion of all S/E graduate students. The same institutions accounted for over three-fourths of both the FTE personnel in research and development and academic R&D expenditures.

Public institutions accounted for about two-thirds of all employed academic scientists and engineers and S/E graduate students and nearly two-thirds of all academic R&D expenditures. Between 1973 and 1980, S/E employment rose at public institutions by an average of 4 percent per year, compared to a rise of only 1 percent annually at private institutions. Graduate S/E enrollment, on the other hand, rose at a higher average annual rate at private institutions than at public institutions between 1974 and 1979—9 percent compared to 6 percent.

sex of scientists and engineers, 1974-80

In 1980, men outnumbered women in the academic S/E labor force by four to one, accounting for 83 percent of all full-time and 75 percent of all part-time personnel (tables B-21 and B-25 and chart 22). Women have gradually increased their share of the total number of full-time S/E professionals from 15 percent in 1974 when data were first collected by sex to 17 percent in 1980. This almost imperceptible proportionate rise, however, conceals the rapid rate of increase in the number of women employed in academia relative to men. The number of women employed full time as scientists and engineers at universities and colleges during this period grew at an average rate of 6 percent per year compared to 2 percent for men. Data compiled by NCES for the academic year 1979/80 showed that among faculty in all ranks and disciplines, women appeared most often in the lower professional ranks (i.e., lecturer, instructor, assistant professor.)[20] Data collected by NSF for the first time in 1980 show that women accounted for one-fourth of the scientists and engineers employed part time, compared with only about one-sixth of those employed full time.



Universities and colleges employed a more even mix of men and women than existed in the S/E labor force as a whole. The percentage of all academic S/E personnel accounted for by women, 19 percent in 1980, was more than twice the proportion of S/E women employed in all sectors of the economy, 9 percent.[21]

The distribution of women professionals employed in S/E disciplines varied considerably from that of men, both nationally and in the academic sector. In 1980, more than one-half of all women employed full time in S/E positions at academic institutions were in the life sciences; the biological and medical sciences combined accounted for 45 percent (chart 23). In contrast, only 3 percent of all women employed full time as scientists and engineers were in the environmental sciences and engineering together, although the number of women in each of these disciplines has doubled since 1974. The distributions by field of both sexes have changed little, however, over the 6-year period covered (table B-21).

The growth rate of women exceeded that of men in every major S/E field during the 6-year period, 1974-80. Between 1974 and 1980 the number of women employed full time changed most dramatically in engineering, up 13 percent per year, and in the environmental sciences, up 12 percent per year (table B-21 and chart 24).

Women made up 30 percent of the psychologists and 23 percent of the life

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[19] Howard P. Tuckman, "Part-time Faculty: Some Suggestions of Policy," *Change*, January/February 1981, pp. 8-10.

[20] Department of Education, National Center for Education Statistics, *Faculty Salaries, Tenure, and Benefits, 1979-80* (Washington, D.C., 1981), table C, p. 5.

[21] National Science Foundation. *U.S. Scientists and Engineers, 1978*, *op. cit.*, table 2, p. 4.

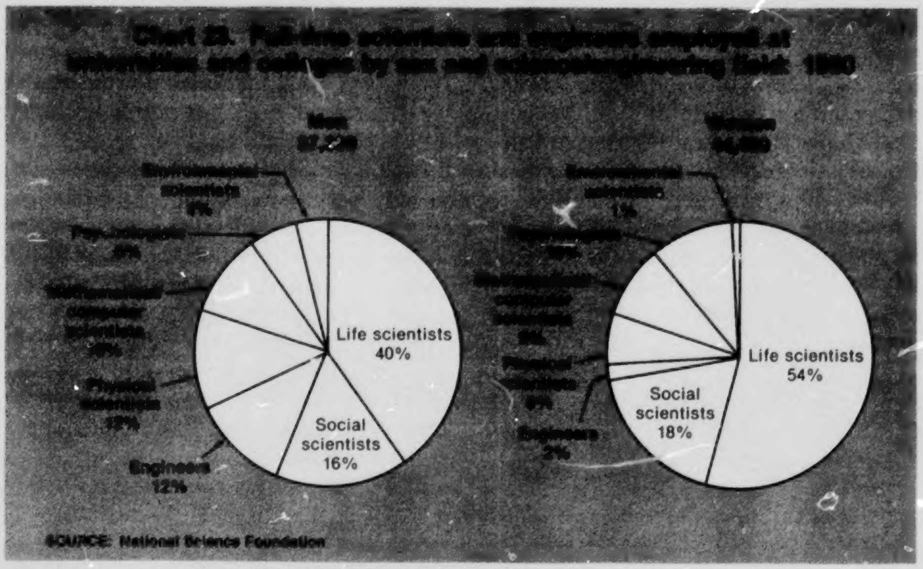

Chart 23. Full-time scientists and engineers employed at universities and colleges by sex and science/engineering field: 1980

SOURCE: National Science Foundation

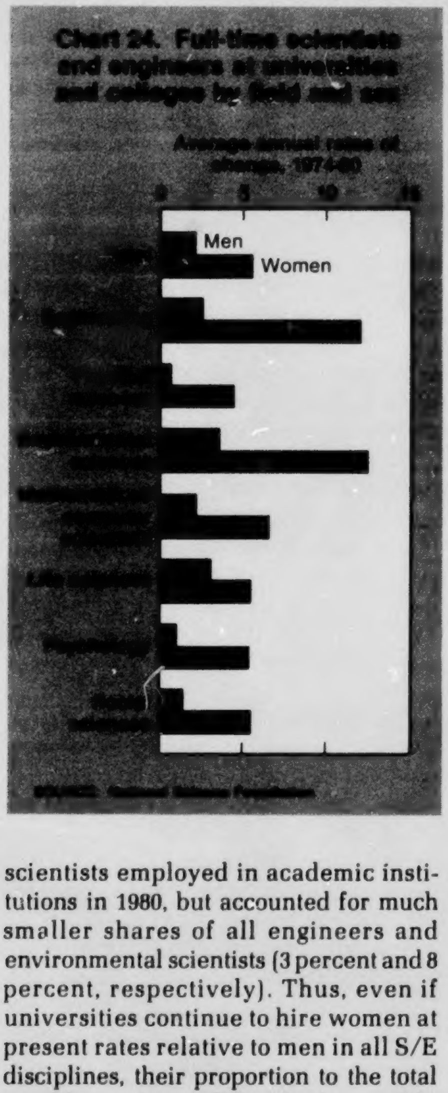

Chart 24. Full-time scientists and engineers at universities and colleges by field and sex

SOURCE: National Science Foundation

scientists employed in academic institutions in 1980, but accounted for much smaller shares of all engineers and environmental scientists (3 percent and 8 percent, respectively). Thus, even if universities continue to hire women at present rates relative to men in all S/E disciplines, their proportion to the total would remain small for the forseeable future.

The ability of higher education institutions to sustain the 1974-80 employment growth rate for women in the coming decade by providing new openings may be restricted, however, by declining enrollment levels, slower retirements due to the elimination of the mandatory retirement age, the high proportion of academic faculties with tenure, and uncertainty concerning the level of continued support from Federal and State Governments. One NRC-sponsored study suggested that the turnover in faculty positions in response to falling enrollment, as forecast for the eighties, may reduce the number of faculty openings by one-half.[22]

Besides the prospect of having fewer positions to offer women in the future, university hiring officials are already forced to compete in the job market with industry for S/E-trained candidates in several areas. For example, nearly 1,600 full-time engineering faculty positions were vacant in engineering colleges as of fall 1980.[23] A survey of universities and 4-year colleges found that nearly 90 percent of engineering schools reported a decrease in their ability to recruit and retain full-time faculty. This decrease resulted primarily from competition with industry, where higher salaries and other benefits such as more modern facilities and equipment were cited as the major attractions of industrial employment.

Anecdotal information collected by NSF from academic officials indicates that this competition is most intensive in hiring women who are trained as engineers. Presently, women who are employed in higher education receive lower salaries and are less likely to have tenure than their male counterparts. For the 1979/80 academic year, NCES reported that faculty salaries for women in all disciplines and the percentage of tenured women faculty lagged behind men in all professional ranks.[24] It should be noted, however, that since 1975 the proportion of women in all faculty ranks, from lecturer to full professor, has increased steadily.[25] A 1980 study of women scientists employed in industry and government found that although progress had been made in equalizing pay, some salary differences between men and women still remained.[26]

minorities, 1973-79

In the 1979 biennial Survey of Doctorate Recipients conducted by NRC under NSF sponsorship, information on racial background was received from 96 percent of the 332,300 doctoral scientists and engineers reporting in that year; 8 percent of those for whom racial data were available were reported as nonwhite.[27] The total number of scientists and engineers in the United States holding doctorate degrees increased at an average annual rate of 6 percent between 1973 and 1979. White doctorate-holders accounted for 82 percent of the net increase, and Asians for 13 percent. The number of Asians increased the most rapidly of any group, nearly 15 percent per year over the 6-year period (table B-27).

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[22] National Research Council, *Research Excellence Through the Year 2000: The Importance of Maintain a Flow of New Faculty Into Academic Research.* A report with recommendations of the Committee on Continuity in Academic Research Performance (Washington, D.C., 1979).

[23] Atelsek, Frank J. and Irene L. Gomberg, American Council on Education, Higher Education Panel Report Number 52, *Recruitment and Retention of Full-time Engineering Faculty, Fall 1980* (Washington, D.C., October 1981), table 1.

[24] Department of Education, National Center for Education Statistics, *op. cit,* table E, p. 7, table F, p. 8.

[25] *Ibid.*, table C, p. 5, and *Salaries, Tenure, and Fringe Benefits of Full-Time Instructional Faculty in Institutions of Higher Education, 1975-76* (NCES 77-318), table B, p. 2.

[26] National Research Council, *Women Scientists in Industry and Government* (Washington, D.C., 1980), p. 39.

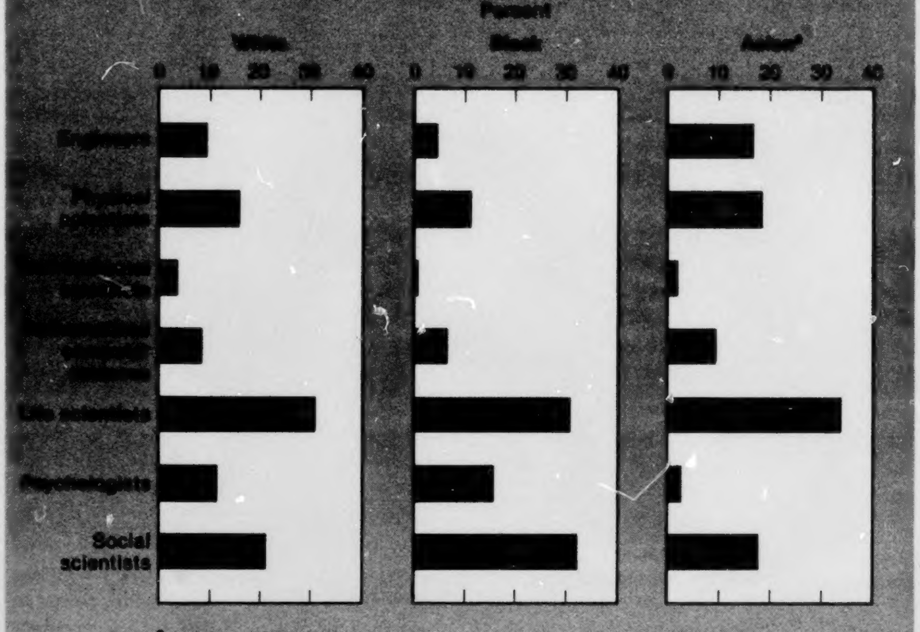
[27] National Science Foundation, *Characteristics of Doctoral Scientists and Engineers in the United States: 1979* (Detailed Statistical Tables) (NSF 80-323) (Washington, D.C., 1980), table B-6, p. 25.

The NRC survey showed that institutions of higher education employed 52 percent of all white scientists and engineers holding the doctorate degree in 1979 and the same proportion of all doctorate scientists and engineers. Universities and colleges accounted for higher proportions of the black and American Indian S/E totals—57 percent of the black S/E doctorates and 64 percent of the Indians. The proportion of Asians employed in academe was only 45 percent, while the industrial sector employed a much larger proportion of Asians than of any other group—40 percent. By contrast, 11 percent of the black S/E doctorates, 19 percent of the American Indians, and 24 percent of the whites were employed in industrial firms.

Scientists and engineers of American Indian or Alaskan origin showed the highest average annual growth rate of all S/E doctorates employed in academia between 1973 and 1979—15 percent—but still comprised less than one-half of 1 percent of all doctoral scientists and engineers employed by universities and colleges. Asians and Pacific Islanders increased at the next highest rate, 11 percent per year, black S/E doctorate-holders increased by 7 percent per year, and whites increased by 5 percent per year.

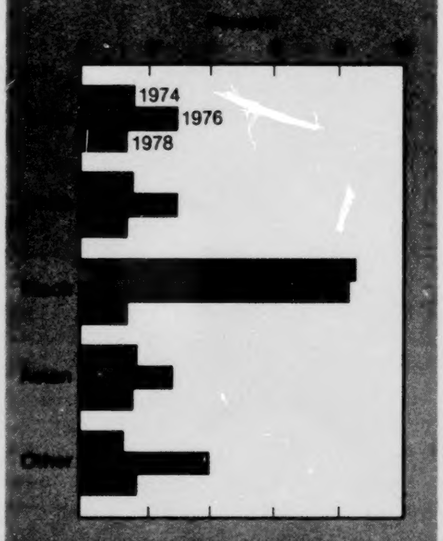
The wide differences in sector of employment among the various racial groups reflects variations in their distribution by field. Asian scientists and engineers, for example, accounted for a lower proportion of academically employed doctorate-holders than of all doctorate-holders but a higher proportion of those employed in industry. The reason is that more than one-third of the scientists and engineers of Asian background with doctorates were working as engineers, an area in which the industrial sector was the predominant employer. Conversely, among black scientists and engineers, the largest proportions were in the life and social sciences, areas in which the higher education sector was the employer of more than three-fifths of the total doctorate-holding population.[28]

Chart 25. Doctoral scientists and engineers employed in academic institutions by field and race: 1979



*Includes Pacific Islanders.
SOURCE: National Science Foundation

Chart 26. Unemployment rate of U.S. scientists and engineers by race



SOURCE: National Science Foundation

The largest proportion of both white and Asian doctoral scientists and engineers employed by universities and colleges was in the life sciences (chart 25). Among blacks, social scientists comprised the largest group. Social scientists were the second largest group among whites, while among Asians, the physical scientists ranked second (table B-28).

In 1978, the latest year for which estimates of unemployment rates of scientists and engineers are available, the rate declined for each racial group (chart 26). In 1974 unemployment among black scientists and engineers was over 8 percent, the highest of all racial groups (table B-29).

postdoctorate utilization

Among the 325,000 scientists and engineers employed in universities and colleges in January 1980, 18,600, or approximately 6 percent, were categorized as postdoctorates on the basis of data reported in NSF's Survey of

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[28] *Ibid.*

Graduate Science Students and Postdoctorates (GSSP), Fall 1979. In that survey, postdoctorates are defined as individuals with science or engineering Ph.D.'s, M.D.'s, D.D.S.'s or D.V.M.'s, or their foreign equivalents, who devote their full time to research or study in a particular department under temporary appointments (generally for a specific time period) which carry no academic rank. The major purpose of these appointments is to provide additional training, although these postdoctorates may contribute to the academic program through seminars, lectures, or working with graduate students. Appointments in residency training programs in the medical and health professions are excluded, unless research training under the supervision of a senior mentor is the primary purpose of the appointment.

The number of postdoctorates employed in universities and colleges increased at an average annual rate of only 2 percent between fall 1974 and fall 1979, compared with an annual rate of 3 percent for the comparable period, January 1975 through January 1980, for all other academic scientists and engineers (table B-30 and chart 27). Between 1974 and 1977, the average annual growth rate for postdoctorates was nearly 6 percent; however, the 18,600 total reported in the fall 1979 survey was 6 percent less than the fall 1977 total. While part of the recent downturn may reflect a real decline in postdoctoral utilization, the numbers in earlier years may have been slightly inflated by the inadvertant inclusion by medical schools of some medical residents and clinical fellows not involved in research. In the survey questionnaire instructions for fall 1979 the definition was rephrased to specify that such residents or fellows should be excluded.

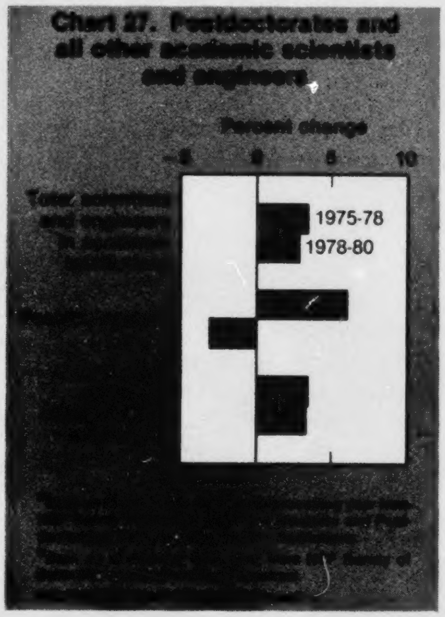


Chart 27. Postdoctorates and all other academic scientists and engineers

Since postdoctorates contribute to the R&D performance at universities and colleges in roles somewhat analogous to those of graduate research assistants, it is of some value to compare the distribution of the two groups. Furthermore, since both groups were financed largely through academic R&D funding, the distribution of R&D expenditures is also of interest.

At the total level, there were 2.6 graduate research assistants for each postdoctorate in fall 1979, up slightly from a ratio of 2.4:1 in 1974. The areas of science and engineering differed significantly with regard to the relative numbers of postdoctorates and graduate research assistants. In the social sciences, there were over 13 graduate research assistants for every postdoctorate; the environmental sciences and engineering also showed graduate research assistant/postdoctorate ratios in excess of 10:1. At the other end of the spectrum, there were almost as many postdoctorates as graduate research assistants in the life sciences.

The distribution of postdoctorates by area of science/engineering tended to be closer to that of R&D expenditures than did the distribution of graduate research assistants (chart 28). The life sciences accounted for a majority of both postdoctorates and R&D expenditures, but for only 31 percent of the graduate research assistants (table B-31). During the 1974-79 period, the number of graduate research assistants at doctorate-granting institutions rose 4 percent per year (table B-32 and chart 29).

The Federal Government provided major support to three of every four postdoctorates in 1979, a slight rise from the earlier years when the proportion whose major source of support was the Federal Government fluctuated around 70 percent. All of the sharp decline in postdoctorates reported between 1977 and 1979 occurred among those whose primary source of support was non-Federal.

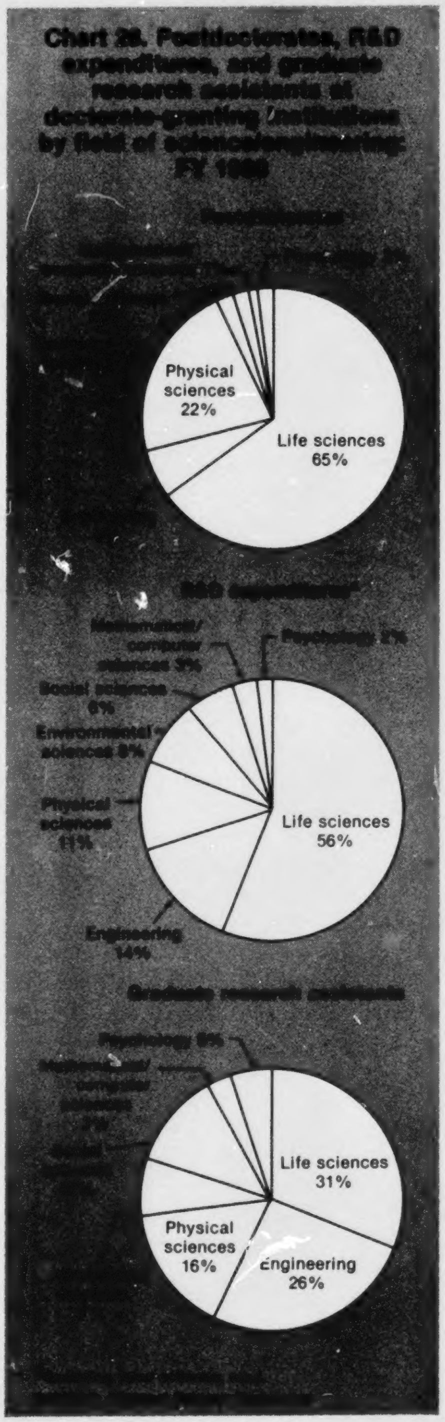
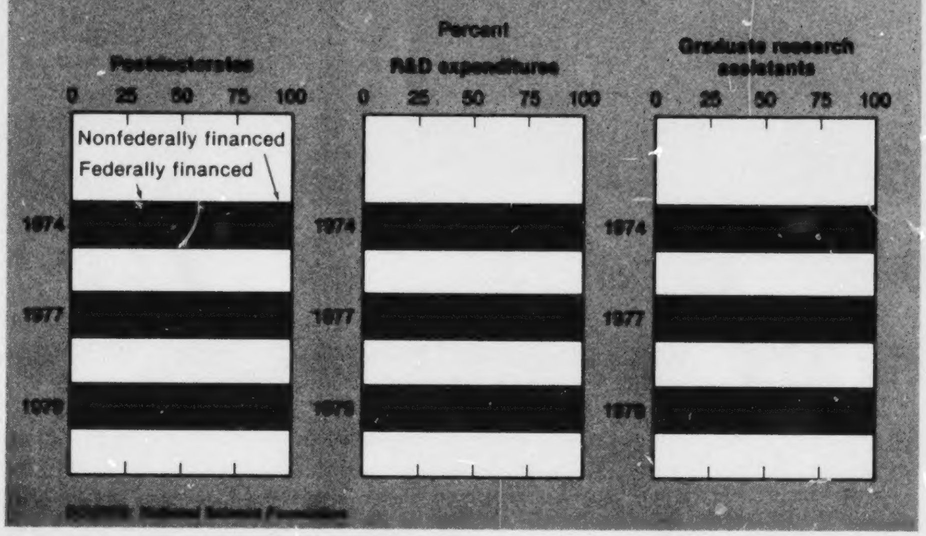


Chart 28. Postdoctorates, R&D expenditures, and graduate research assistants at doctorate-granting institutions by field of science/engineering: FY [illegible]

The 10,300 postdoctorates employed in publicly controlled universities and colleges, although representing a slight decline from the 1977 peak, increased as a proportion of the total because of the sizable decline in the number of postdoctorates reported by private institutions (5 percent per year). This is consistent with the declining share of all research and development per-

Chart 29. Postdoctorates, R&D expenditures, and graduate research assistants at doctorate-granting institutions in the sciences and engineering by source of support



SOURCE: National Science Foundation

formed by private institutions, as reported in part 1. Since the decline affected engineering and the physical, environmental, and life sciences in both public and private institutions, it is evident that a real decline occurred and that not all of the drop can be traced to the inclusion of medical residents, as noted earlier.

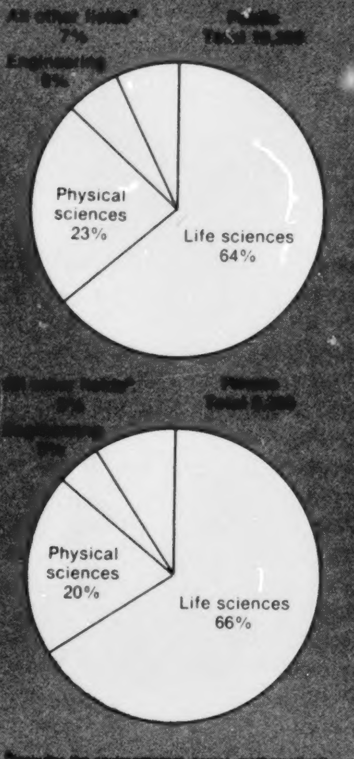
Little difference between public and private institutions in the distribution by field was observed. In both types, life scientists comprised about two-thirds of the total, with physical scientists and engineers making up most of the remainder (table B-33 and chart 30).

Women comprised 18 percent of the postdoctorates reported in fall 1979, about one-half the proportion of women among all scientists and engineers in the 1978 S/E labor force. Three-fourths of the women postdoctorates were life scientists, compared with 62 percent of the men. For both sexes, the physical scientists were the second largest group, accounting for 11 percent of the women and 24 percent of the men (table B-34).

Nearly one-third of the postdoctorates employed in American universities and colleges were foreigners, almost the same proportion as in 1977. These foreign postdoctorates differed sharply from their American colleagues in terms of field distribution. Whereas 72 percent of the American postdoctorates were life scientists, these fields accounted for only 51 percent of foreign postdoctorates. Physical scientists comprised 16 percent of the U.S. citizen postdoctorates but 33 percent of the foreigners. In engineering, the difference was even more marked. Eleven percent of the foreign postdoctorates were engineers, but engineers made up only 3 percent of those with U.S. citizenship. In fact, among engineering postdoctorates foreigners outnumbered Americans by more than three to two (table B-33 and chart 31).

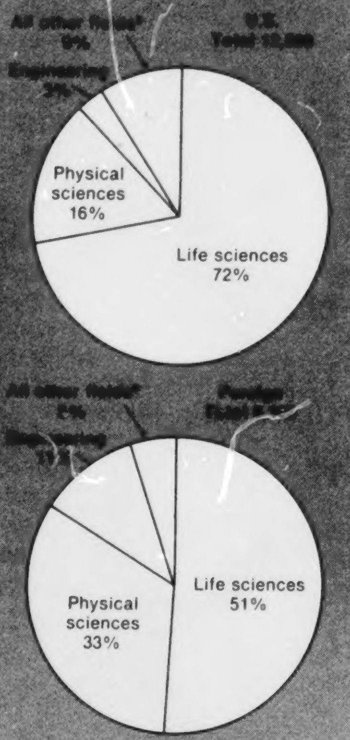
Besides the 18,600 postdoctorates for whom data were provided in the graduate student survey, an additional 2,700 scientists were reported in fall 1979 as "other nonfaculty doctoral research staff." Life scientists made up the largest contingent, with 56 percent of the total, followed by physical scientists who comprised 18 percent of the total. Women accounted for 23 percent of nonfaculty doctoral research personnel. Nearly three-fourths of the women were reported as life scientists, compared with one-half of the men (table B-34).

Chart 30. [illegible] 1979



*Includes the environmental, social, mathematical/computer sciences and psychology.
SOURCE: National Science Foundation

Chart 31. Postdoctorates at doctorate-granting institutions by citizenship and field of science/engineering: 1979



*Includes the environmental, social, mathematical/computer sciences and psychology.
SOURCE: National Science Foundation

part 3.

trends in graduate s/e enrollments

general charactistics, 1975-80

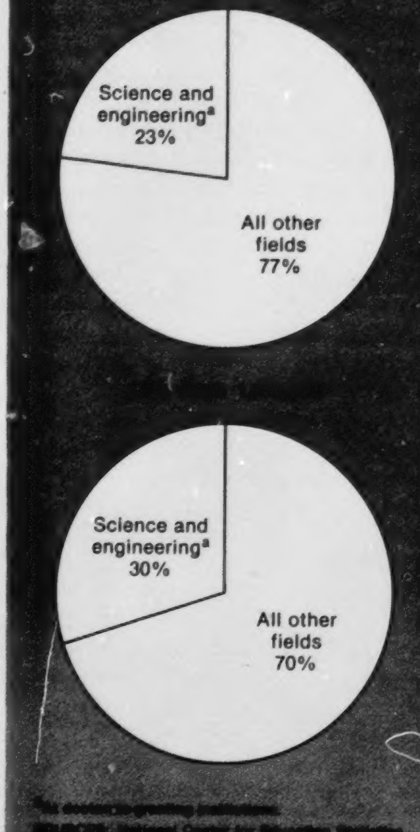
Along with the increases in current R&D expenditures at universities and colleges and academic employment of scientists and engineers, the number of students enrolled for advanced study in the sciences and engineering grew throughout the late seventies, at an average annual rate of almost 3 percent. Data from the fall 1980 survey indicate that this growth rate continued in the 1979/80 period. Fall 1980 graduate S/E enrollment in doctorate-granting institutions was up 4 percent over fall 1979, in contrast to a 6-percent decline in enrollment at master's-granting institutions. Full-time enrollment grew at a slightly higher rate between 1979 and 1980 than did part-time enrollment, in contrast to earlier years when the growth rates in part-time enrollment were significantly higher than those in full-time enrollment.

Departmental coverage of the NSF Survey of Graduate Science Students and Postdoctorates, which forms the basis for this part of the report, has expanded gradually since the inception of the survey series in 1972. Summary data on graduate students enrolled at institutions granting a master's as the highest degree in the sciences and engineering were first collected in 1975 through 1977. These institutions were not surveyed in 1978, and detailed information on enrollment at master's-granting institutions comparable to that collected from doctorate-granting institutions is available only for 1979. The bulk of this section of the report, therefore, will be concentrated on 1975-79 graduate enrollment trends in doctorate-granting institutions only. These institutions also accounted for 98 percent of all academic research and development in the United States in 1979,[29] and for 67 percent of all academically employed scientists and engineers in January 1980, as discussed earlier.[30]

enrollment and degree patterns, 1975-79

Graduate S/E enrollment at doctorate-granting institutions grew from 295,600 in 1975 to 321,800 in 1979, an average annual increase of 2 percent. Most of the growth occurred during the latest year of the 4-year period; in the earlier years (1975-78) the average growth rate was less than 2 percent per year. Also, the proportion of all graduate students enrolled in S/E courses rose from 23 percent in 1975 to 30 percent in 1979 (table B-35 and chart 32).

[illegible]



[a]In doctorate-granting institutions.

SOURCES: National Center for Education Statistics, HEW, and National Science Foundation.

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[29] Based on data collected in the annual surveys of the Department of Education, National Center for Education Statistics in *Opening Fall Enrollment in Institutions of Higher Education* (Washington, D.C.). The 1979 figure is preliminary.

[30] National Science Foundation, *Academic Science: R&D Funds, Fiscal Year 1979*, op. cit., pp. 7 and 8.

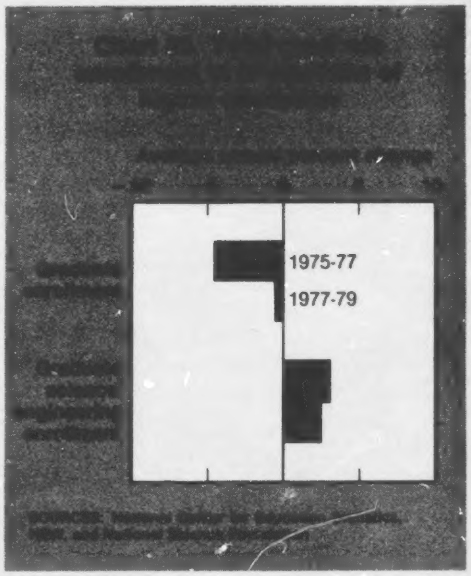
This growth in graduate S/E enrollment occurred in spite of steady declines in overall graduate enrollment; between 1975 and 1979 the total number of students enrolled in postbaccalaureate study fell from 1,267,500 to 1,074,900, an average annual decline of 4 percent.[31] Total S/E graduate enrollment increased during the same period by an average of 3 percent per year, to 375,300. Only about one-half of the universities and colleges in the United States that offered postbaccalaureate studies had programs leading to the Ph. D. or other doctorate degrees, and these institutions enrolled about six of every seven graduate students.

The expansion and contraction of total graduate enrollment and the distribution of students among fields, both science and nonscience, are the products of a number of external influences. First, of course, is the total college-age population. A number of recent demographic studies have predicted a serious decline in total enrollment in higher education on the basis of the downturn in birthrates which began in the late fifties.[32]

Less than one-half of the population between the ages of 18 and 24 is enrolled in institutions of higher education at any level.[33] It may therefore be more appropriate to examine the trend in baccalaureates awarded, since recent graduates constitute the pool from which the vast majority of graduate students is drawn. After increasing at an average annual rate of 9 percent during the late sixties and early seventies, the number of bachelor's degrees awarded peaked at 945,800 during the academic year 1973/74. Between 1974 and 1979 the total declined slightly but with no pattern traceable to changes in the birthrate.[34] On the contrary, the fluctuations in the period after 1974 seem to be more closely related to the general political and economic situation. For example, the end of the draft and American military involvement in Southeast Asia in 1974 was followed by a 7-percent average annual decline in total graduate enrollment between 1975 and 1977, compared with a decline of less than 1 percent per year between 1977 and 1979 (table B-35 and chart 33).

Various analysts have cited a number of other possible explanations for this downturn in overall graduate enrollment. The decisions of high school graduates on whether to attend a college or university and the decisions of bachelor's degree-holders on whether to begin or continue graduate study are based on, among other criteria each student's perception of the relative advantages in terms of lifetime income and job satisfaction weighed against the costs. These costs are of two types: Immediate tuition bills and earnings foregone during the period of study. For example, during the 1974-78 period, tuition in private institutions rose at about 7 percent, the same average annual rate as inflation and at only a slightly slower rate in public institutions.[35] During the same period, however, the gap between median annual salaries of college graduates and high school graduates narrowed significantly for both men and women.[36]

The comparatively steady rate of S/E graduate enrollment growth seems to be the product of offsetting forces on three levels: An increase in the number of women enrolled in graduate schools was balanced by a decline in the number of men; an increase in the number of minority students was offset by a decline in the number of whites; and an increase in the number of older students was balanced by a decline in the number of 18- to 24-year-olds.[37]



General expectations of an oversupply of doctorate-holders in the coming decade in some fields—especially the arts, humanities, and social sciences—has led to a reluctance on the part of many bachelor's degree-holders to pursue advanced training for academic jobs which might not exist when they complete their education. Given the anticipated cutbacks in academic hiring—a result of the extensive hiring and liberal granting of tenure during the period of rapid expansion during the sixties—this reluctance affected most severely those fields in which academic institutions were the primary employers of doctorate-holders. In the academic year 1977/78, more than two out of three of those receiving doctorates in education, the humanities, and professional fields found employment in academic institutions, whereas in engineering and the life and physical sciences the ratio was less than one in three.[38]

Graduate S/E enrollment increased much faster between 1975 and 1979 in master's-granting institutions than in doctorate-granting institutions—6 percent per year compared to 2 percent per year (table B-36 and chart 34). This growth rate was also faster than the 3-percent average annual growth in the employment of scientists and engineers in master's-granting institutions. In doctorate-granting institutions, however, the reverse was true: While the number of S/E graduate students enrolled rose at an average annual rate of 2 percent, the increase in employment of scientists and engineers averaged 4 percent per year, primarily as a result of the employment increases in large research universities.

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[31] National Science Foundation, *Academic Science: Scientists and Engineers, January 1980, op. cit.*, tables 1 and 4.

[32] For example, see Fred E. Crossland, "Learning to Cope with a Downward Slope," *Change*, July/August 1980, p. 18.

[33] The proportion of all 18- to 24-year-olds enrolled in universities and colleges has been stable at about two out of five since 1974, as reported in W. Vance Grant and Leo J. Eiden, *Digest of Education Statistics, 1980*. Department of Education, National Center for Education Statistics (NCES 80-401) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1980), p. 87.

[34] *Ibid.*, p. 133, for 1965-66 through 1977-78; the preliminary figure for bachelor's degrees awarded in 1978-79 is 921,290.

[35] See Department of Education, National Center for Education Statistics, *Digest of Education Statistics, 1980* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office), p. 144, tuition in private institutions increased by a total of 44 percent over the 1974/78 period; in public institutions the increase was 37 percent. In constant dollars, however, tuition costs were stable in private institutions and declined by 5 percent in public institutions.

[36] Dearman, Nancy B. and Valena White Plisko, *The Condition of Education, 1979 Edition*. Department of Education, National Center for Education Statistics (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1979), p. 204.

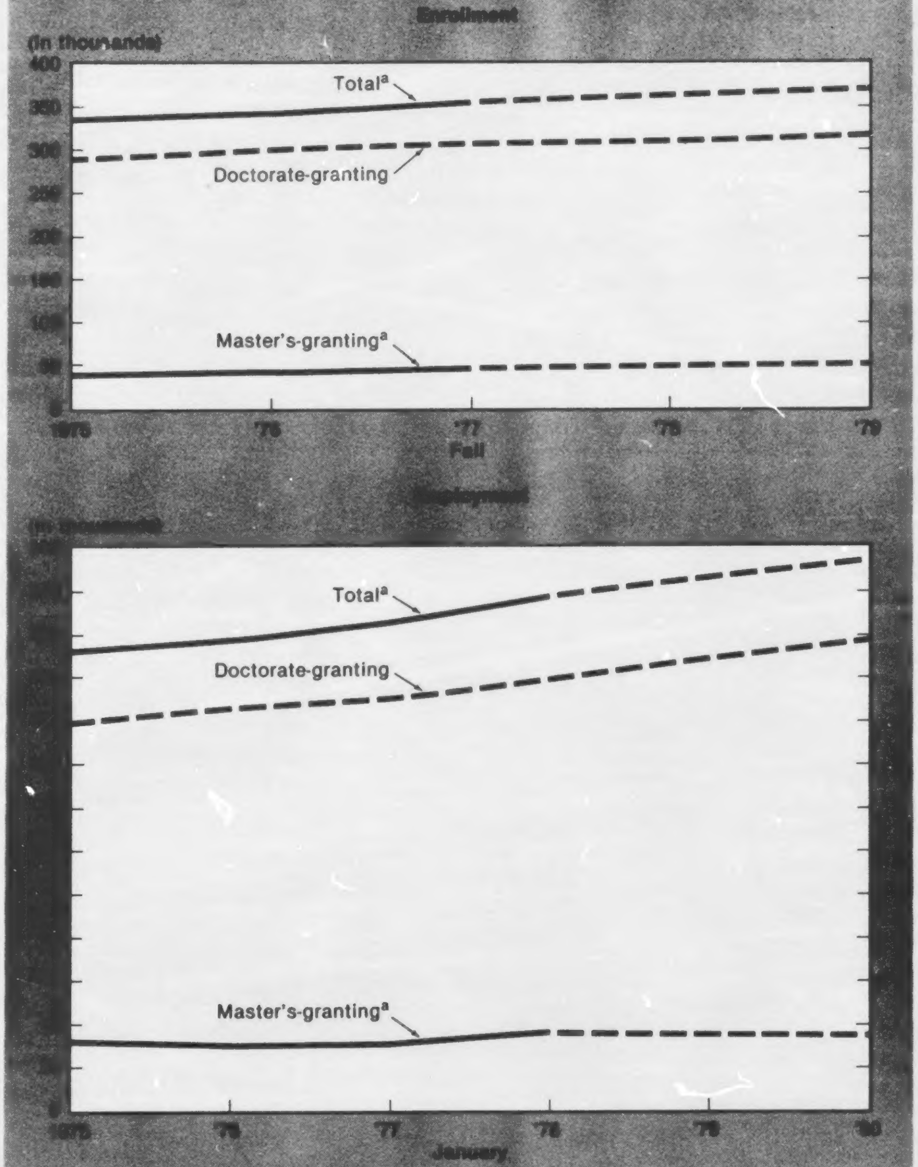
[37] For further discussion of the potential effects of these shifts in enrollment patterns, see Carol Frances, "Apocalyptic vs. Strategic Planning," *Change*, July/August 1980, p. 19.

[38] Department of Education, National Center for Education Statistics *Digest of Education Statistics, 1980, op. cit.*, p. 134.

It would be reasonable to assume that fluctuations in the production of bachelor's degrees will be reflected in similar fluctuations of master's degrees one or two years later, and of doctorates at some even later time. No such direct relationship is established because of the multiplicity of other factors affecting shifts in graduate enrollment and degrees conferred. While the number of bachelor's degrees awarded in all fields was stable during the 5-year period 1974-79, the number of master's degrees awarded increased at an average annual rate of nearly 2 percent and the number of doctorates awarded declined by almost 1 percent per year. Significant increases at all three levels were reported only in the health fields: Health-related baccalaureates awarded grew by 8 percent per year, master's degrees by 10 percent per year, and doctorates at an average annual rate of 4 percent. In S/E fields, the number of baccalaureates and doctorates awarded declined, at annual rates of 1 percent and nearly 2 percent, respectively (table B-37 and chart 35).

In 1975, the largest number of graduate students was enrolled in courses in the social sciences; in 1976 and subsequent years those in the life sciences have comprised the largest group with a 27-percent share compared to 24 percent in the social sciences. The sizable growth rate in the life sciences (nearly 5 percent per year between 1975 and 1979) is traced to the very rapid growth in health science enrollment, 12 percent per year. At the other end of the scale, graduate enrollment in the physical sciences remained virtually level, increasing at an average rate of only one-half of 1 percent per year.

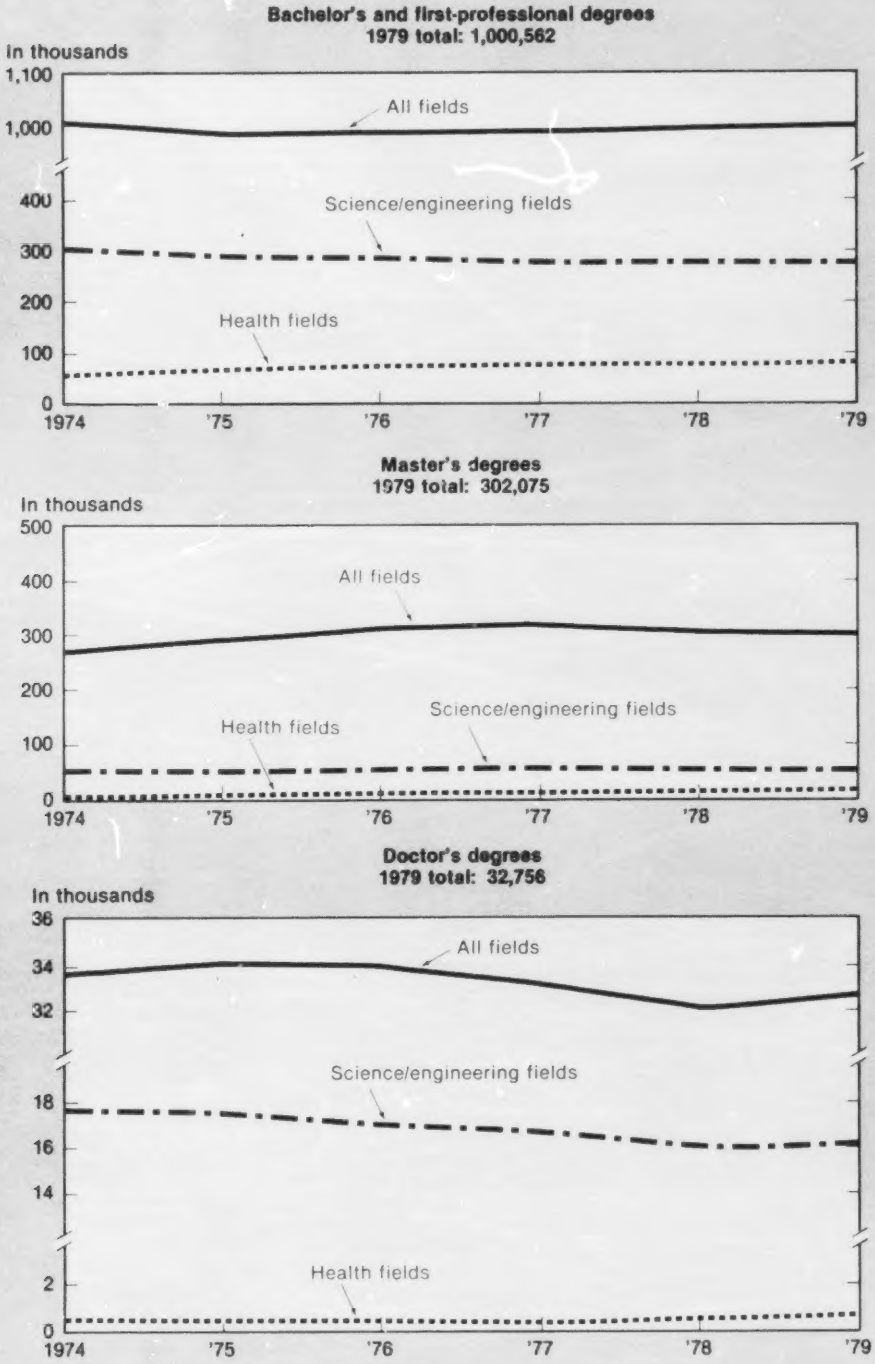
Chart 34. Graduate enrollment and academic employment in the sciences and engineering by type of graduate institution



[a] Data on enrollment for 1978 and employment for 1979 were interpolated for master's institutions.

SOURCE: National Science Foundation

Chart 35. Number of degrees granted by institutions of higher education by level and field



Bachelor's and first-professional degrees
1979 total: 1,000,562

Master's degrees
1979 total: 302,075

Doctor's degrees
1979 total: 32,756

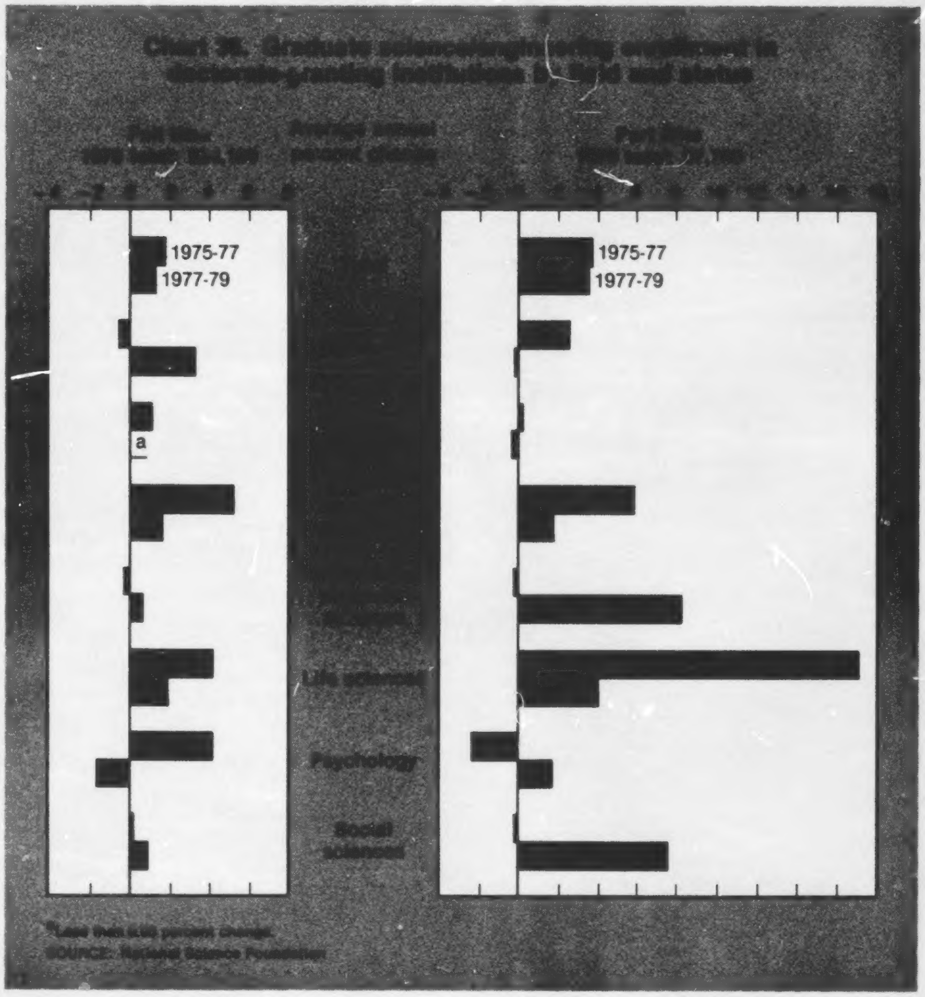
SOURCE: National Center for Education Statistics (HEW)

full-time graduate s/e enrollment in doctorate-granting institutions

Since comparable data on graduate S/E enrollment in master's-granting institutions and on part-time enrollment are not available for all years from the GSSP survey, the remainder of this part of the report focuses on full-time graduate students enrolled in doctorate-granting institutions. These students represented about three out of every five S/E graduate students in 1979; the number increased at an average rate of 2 percent per year between 1975 and 1979. The number enrolled part time increased more rapidly than did the number enrolled full time. Part-time students comprised only one-fourth of the total number enrolled in 1979, but made up almost one-half of the net increase over the 4-year period.

In most fields, growth rates of full-time S/E graduate students enrolled in doctorate-granting institutions were slightly higher during the 1975-77 period than during the 1977-79 period. In the earlier period, the most rapid growth in full-time graduate enrollment occurred in the environmental sciences (5 percent per year), followed by the life sciences and psychology (4 percent annually). Full-time enrollment in engineering, after a slight decline in the 1975-77 period, grew by 3 percent per year between 1977 and 1979 (table B-38 and chart 36). It should be noted, however, that a substantial proportion of this growth can be attributed to the rapid rise in the number of foreign nationals—most of them on temporary student visas—enrolled for graduate degrees in engineering at American institutions. (This subject is discussed more fully in a later subsection of this report.)

The number of first-year graduate students enrolled in doctorate-granting institutions continued to decline—though by only 2 percent between 1978 and 1979, compared with an 8-percent drop between 1977 and 1978—and the growth rate accelerated for those beyond their first year from 5 percent to 7 percent (table B-39). The downturn in numbers of first-year graduate S/E students and rise in those beyond their first year indicate that such negative factors as rising tuition and the anticipation of difficulty in finding S/E employment continued to have an influence.



[a] Less than 0.05 percent change.

SOURCE: National Science Foundation

sources of support

As a result of tuition increases during the 1975-79 period, students desiring to continue studies beyond the bachelor's degree faced growing difficulties in financing their graduate education. The largest group, those graduate students receiving primary support from their institutions, accounted for about 37 percent of the full-time total throughout the period, while those graduate students who were reported as being their own primary source of support declined slightly from 32 percent to 30 percent of the total.

The most rapid growth rate between 1975 and 1977 occurred in the number of students depending on "other outside support"—4 percent per year. In the 1977-79 period the number of students supported by the Federal Government increased at a rate of slightly over 2 percent per year. The number of students relying primarily on self-support, after remaining virtually level during the 1975-77 period, declined by nearly 1 percent per year during the later period (table B-40 and chart 37).

mechanisms of support

In 1979, about 22 percent of all full-time graduate students in S/E programs in doctorate-granting institutions were supported through research assistantships, and a like proportion through

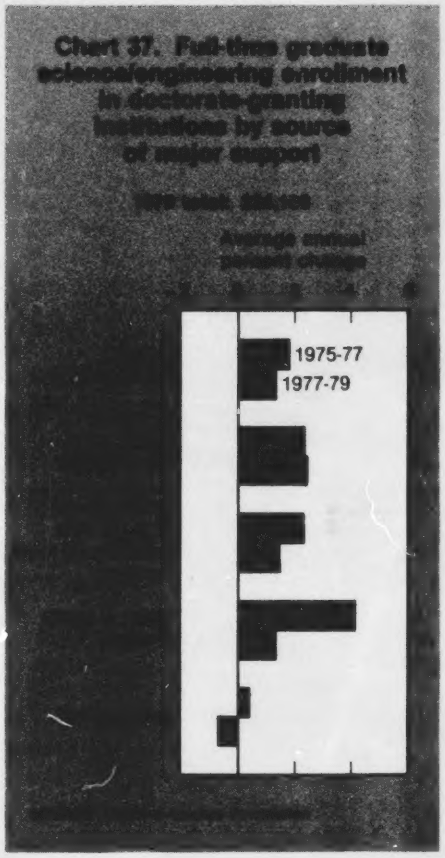


Chart 37. Full-time graduate science/engineering enrollment in doctorate-granting institutions by source of major support

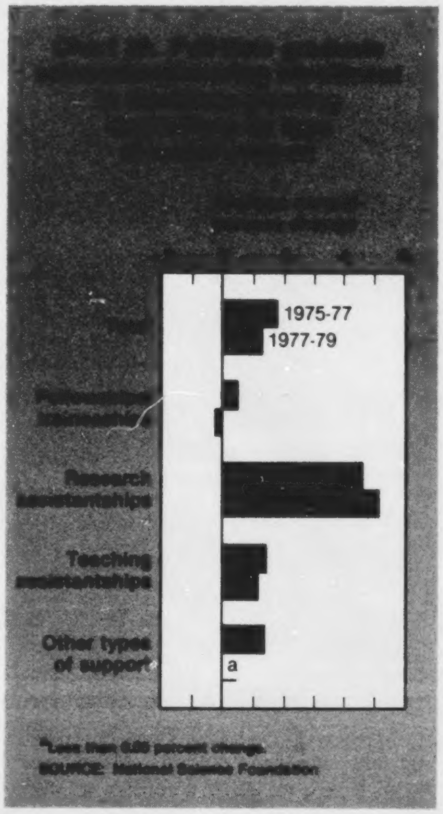
teaching assistantships. Fellowships and traineeships together accounted for an additional 17 percent, and the remaining 39 percent were supported under "other" mechanisms (of which 78 percent were those students reported as self-supporting).

The number of S/E graduate students supported under research assistantships increased at the highest rate of all mechanisms—5 percent per year. In contrast, the number supported under fellowships and traineeships was almost unchanged throughout the 4-year period under consideration—despite the 11-percent average annual decline in the amounts obligated directly by the Federal Government for such support during the 1974-78 period (table B-41). Those relying on other means of support (including self-support) increased by about 1 percent per year in the 1975-77 period and remained level during the 1977-79 period (table B-42 and chart 38).

women in graduate s/e programs

The 1975-79 growth in graduate S/E enrollment is largely a function of the increased participation of women in graduate study. While the number of men enrolled full time in S/E graduate courses declined steadily at a rate of 1 percent per year from 1975 to 1979, the number of women in such courses increased by 10 percent per year from 1975 to 1977 and by 6 percent per year from 1977 to 1979.

Although the growth rates for women graduate students were consistently higher than those for men in all S/E areas, in those traditionally considered masculine occupations the difference was especially marked. For example, the number of women enrolled in graduate study in engineering increased at average annual rates of 11 percent in the 1975-77 period and 20 percent between 1977 and 1979. The environmental sciences also showed sharp increases in the number of women enrolled: 18 percent per year in the earlier period and 13 percent per year in the later period. The number of men enrolled increased in only two areas, engineering and the environmental sciences (table B-43 and chart 39).



aLess than 0.05 percent change.
SOURCE: National Science Foundation

To some extent, the rapid increase in the number of women enrolled in S/E graduate student is simply one indication of women's increasing participation in higher education at all levels. Thus, 1977 was the first year in which women outnumbered men at the junior college level,[39] and in 1978 for the first time women outnumbered men among all undergraduate students.[40]

These enrollment increases were reflected in the number of degrees awarded to women. Psychology led all other fields in the number of doctorate degrees awarded to women (table B-44). Almost one-third of the women who received doctorates during the academic year ending in June 1979 were in psychology—a significantly higher proportion than were enrolled in graduate studies in fall 1979 or than had found employment in the labor force in the previous year as psychologists. In both graduate enrollment and doctorates earned, the proportions of women were almost unchanged from 1977. The life and social sciences together accounted for 70 percent of the women enrolled full time in S/E graduate study at doctorate-granting institutions, but only 53 percent of the women awarded doctorates in 1979 and only 43 percent of all women employed in the sciences and engineering. Only 4 percent of the women graduate students or doctorate recipients were in the mathematical/computer sciences, but 23 percent of the women employed as scientists and engineers were working as mathematicians or computer scientists (table B-45 and chart 40).

The sources of support for women differed significantly from those for men in 1979. While 36 percent of the women enrolled full time were self-supporting, only 28 percent of the men relied primarily on their own funds. In contrast, 38 percent of the men received their major support from institutions, but only

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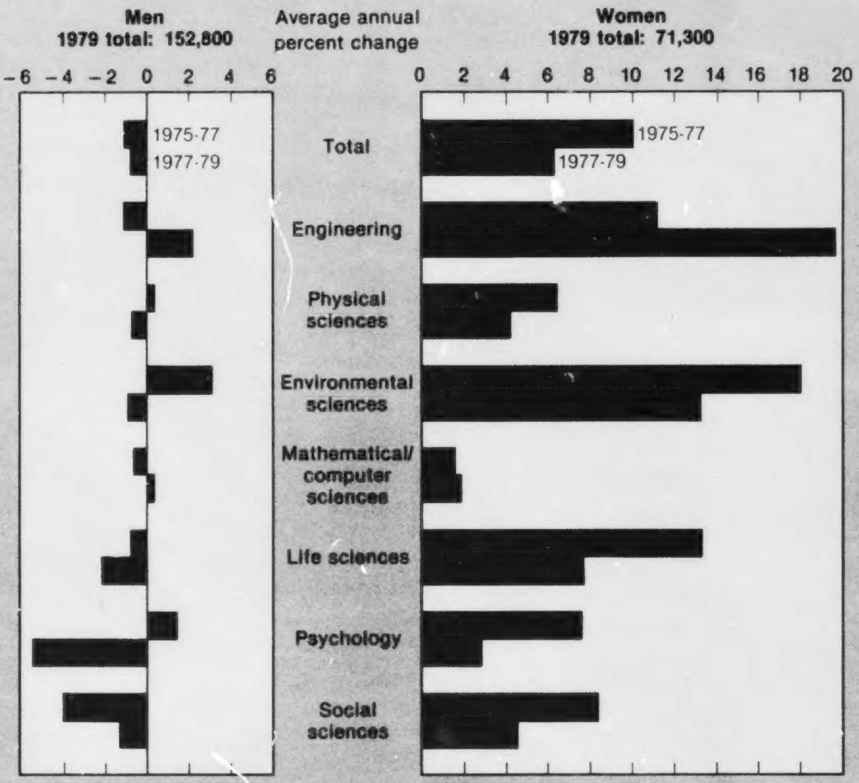
[39] *Ibid.*, p. 103.

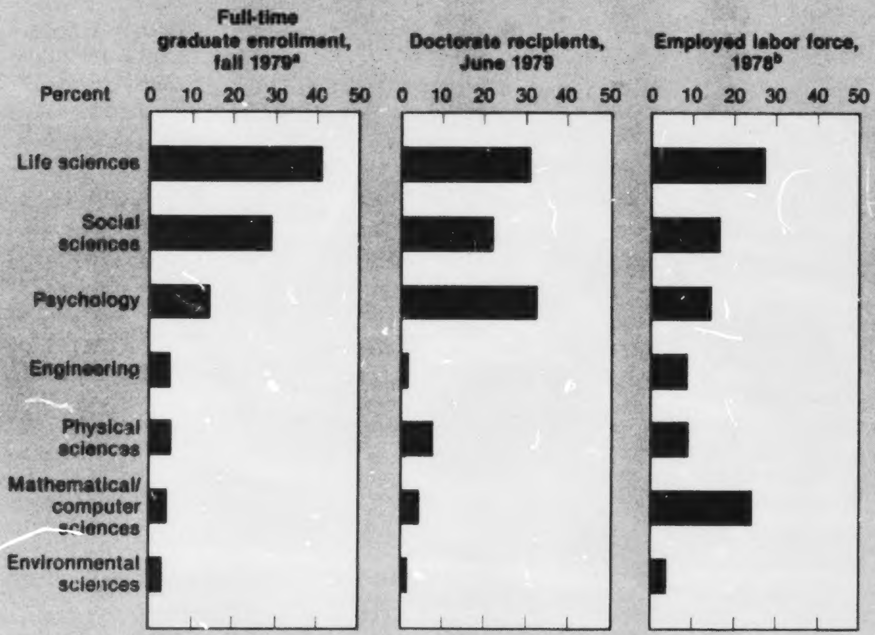
[40] Andrew J. Pepin, *Fall Enrollment in Higher Education, 1978*, (NCES 79-317) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1979), p. 36.

Chart 39. Full-time graduate science/engineering enrollment in doctorate-granting institutions by field and sex



SOURCE: National Science Foundation

Chart 40. Women in science/engineering by field



[a] At doctorate-granting institutions.

[b] Data not yet available for 1980.

SOURCES: National Science Foundation and National Research Council

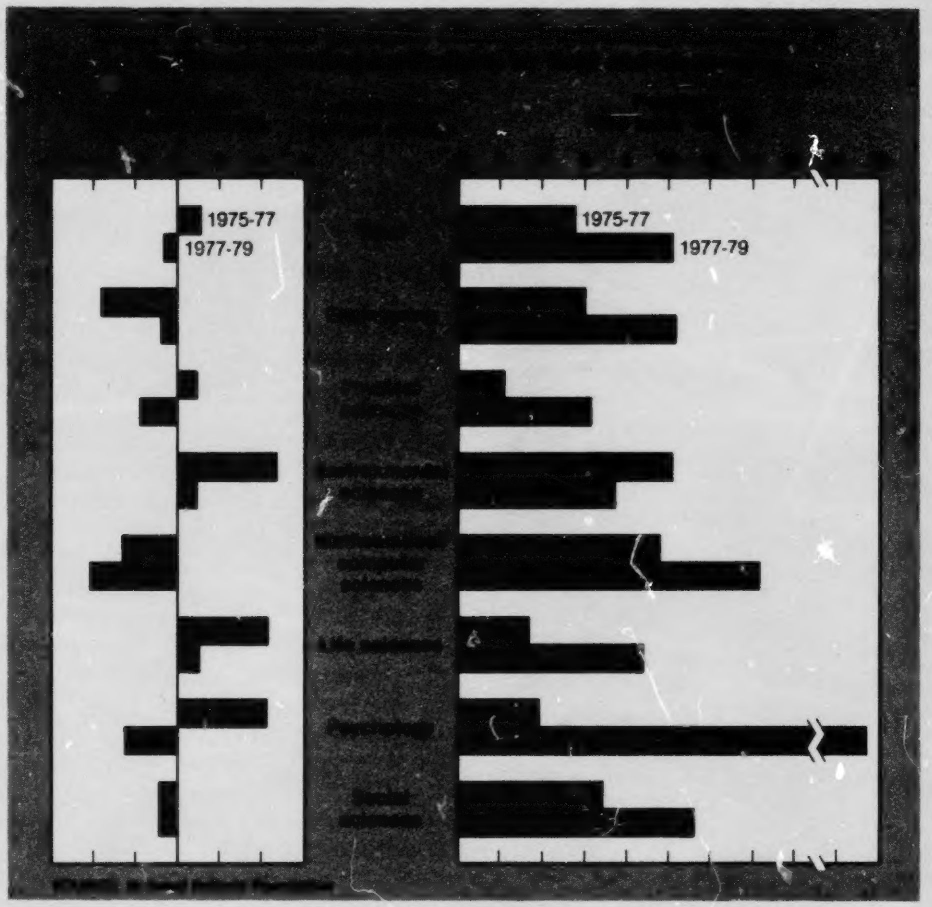
35 percent of the women relied primarily on this source. The Federal Government was the major source of support for 23 percent of the women enrolled full time in graduate S/E programs, almost the same proportion as that of men (table B-46).

foreign graduate students

The proportion of foreign students enrolled full time in S/E graduate programs at doctorate-granting institutions rose from 16 percent to 20 percent between 1975 and 1979. Of the net increase in full-time graduate S/E enrollment during the four years, 88 percent was attributable to the growing number of foreigners enrolled in American institutions. While the number of Americans enrolled as graduate students increased by only 1 percent per year between 1975 and 1977 and decreased slightly between 1977 and 1979, the number of foreigners grew at an average annual rate of more than 5 percent between 1975 and 1977 and accelerated to 10 percent per year between 1977 and 1979.

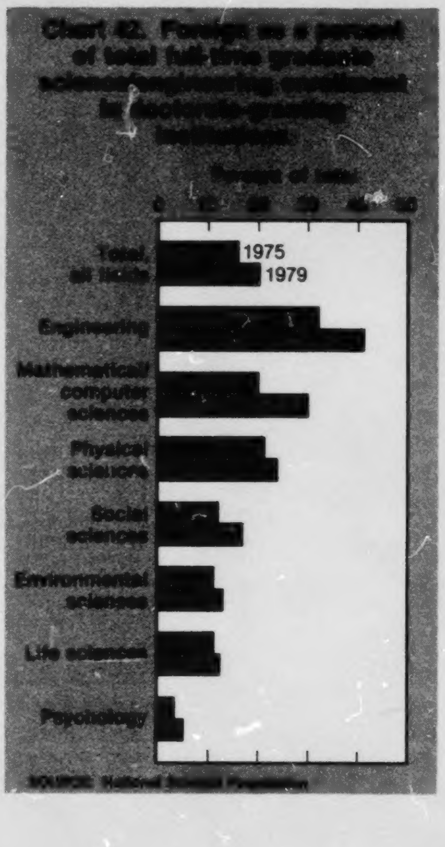
The number of foreign students rose in almost every S/E area at a faster rate between 1977 and 1979 than between 1975 and 1977 (table B-47 and chart 41). American citizens enrolled in graduate study showed significant increases between 1975 and 1977 in only three areas of science and engineering: The environmental sciences (5 percent per year) and the life sciences and psychology (4 percent per year each), along with sharp declines in engineering and the mathematical/computer sciences (4 percent and 3 percent per year, respectively). Between 1977 and 1979, however, declining enrollment of U.S. citizens was reported in five of the broad areas of science and engineering, with only the life and environmental sciences showing slight increases.

The increase in foreign S/E graduate enrollment is consistent with the growth in the number of nonresident aliens enrolled in all fields and at all levels of higher education reported by NCES of the Department of Education (in earlier years, the Office of Education within HEW). From 1976 to 1978, the most recent period for which detailed NCES data are available, total graduate and undergraduate foreign enrollment increased at an average annual rate of 7 percent. In general, the proportion of foreigners was higher at the graduate level than at the undergraduate level and higher also in the sciences and engineering than in the arts and humanities.[41]



The largest proportion of foreigners enrolled in graduate S/E programs was reported in engineering—41 percent of all engineering graduate students in 1979, compared with 32 percent in 1975. The mathematical/computer sciences also showed a foreign student percentage significantly above the average, with 30 percent, up from 20 percent four years earlier (chart 42).

The continuing rapid growth in the number of foreign students enrolled in S/E graduate courses in American institutions has presented problems both



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[41] "Nonresident Alien Enrollments and Degrees Are Increasing" *NCES Bulletin* (NCES 80-305) (Washington, D.C., Department of Education, 1980).

for the students themselves and for their host institutions, especially in the case of those from the developing nations. A 1979 report by the National Association of Foreign Student Affairs (NAFSA) describes some of these problems. Although the study pertains to students in all fields and at all levels, it is equally applicable to S/E graduate students. On the part of the students, lack of sophisticated or even adquate equipment in their home countries combined with resistance to imported technology on the part of their colleagues who have not had American training makes their adjustment to conditions in their home countries more difficult. The institutions are faced with the problem of trying to adapt programs and courses originally designed for American students to suit the special needs of those from abroad.[42]

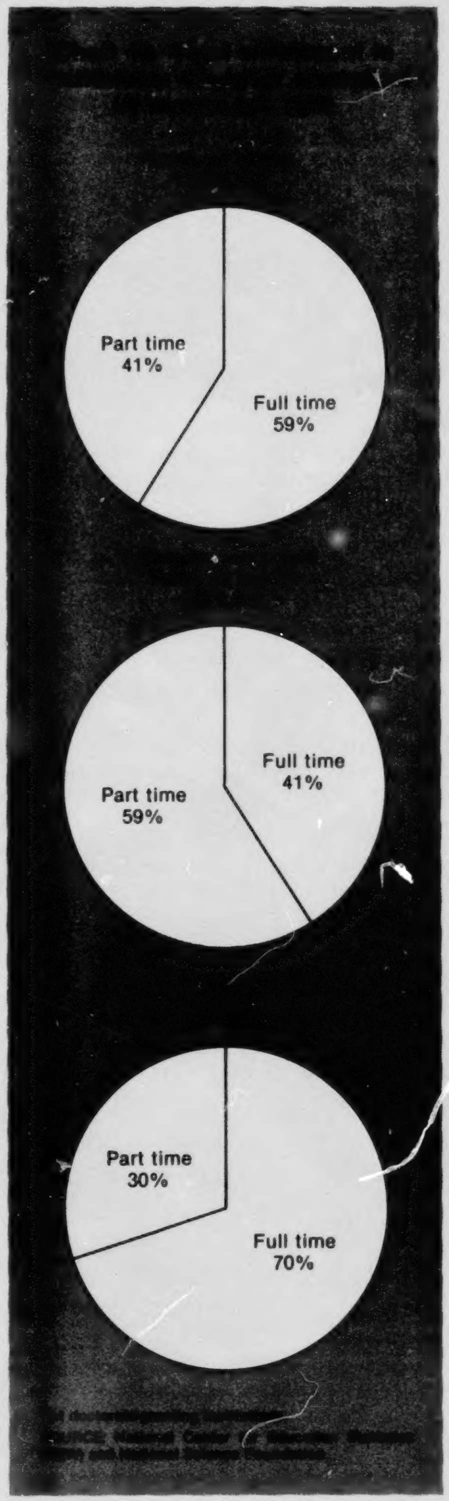
A recent NSF report, *Foreign Participation in U.S. Science and Engineering Higher Education and Labor Markets*, gives some indication of the significance of the growing numbers of foreigners enrolled in American universities and colleges for advanced study in the sciences and engineering. In 1979, one of every five S/E graduate students and doctorate recipients was a foreign citizen; in engineering the proportion was one out of two doctorate recipients. If the trend continues and those students on temporary visas acquire permanent status, the effect on the engineering labor force could mean that by 1990 one out of three engineers working in the United States would be a foreign national, compared to about one out of eight in 1979.[43]

part-time graduate s/e enrollment at doctorate-granting institutions

In addition to the 224,100 S/E graduate students enrolled full time at doctorate-granting institutions, 97,700 were reported as enrolled part time—up nearly 4 percent per year since 1975. These students represented 30 percent of all S/E graduate students enrolled in doctorate-granting institutions in 1979, up only slightly from the 29 percent who were reported as part time in 1975 and considerably less than their 59-percent share of all graduate students in all fields in 1979 (table B-48 and chart 43).

The 4-percent average annual growth rate in part-time graduate enrollment in the sciences and engineering in the 1975-79 period was twice the 2-percent average annual increase in full-time S/E graduate enrollment. Between 1975 and 1979, part-time graduate enrollment in all fields fell at an average annual rate of 6 percent, compared with a 1-percent per year decline in full-time enrollment (table B-49 and chart 44).[44]

The distribution by field of part-time graduate students differed sharply from that of full-time students. Part-time graduate students enrolled in engineering made up the largest single group with 30 percent of the total, followed by the social sciences with 27 percent. By contrast, 30 percent of the full-time enrollment was in the life sciences, but only 21 percent of the part-timers. Those in the physical sciences made up 10 percent of the full-timers compared to only 3 percent of the part-timers.



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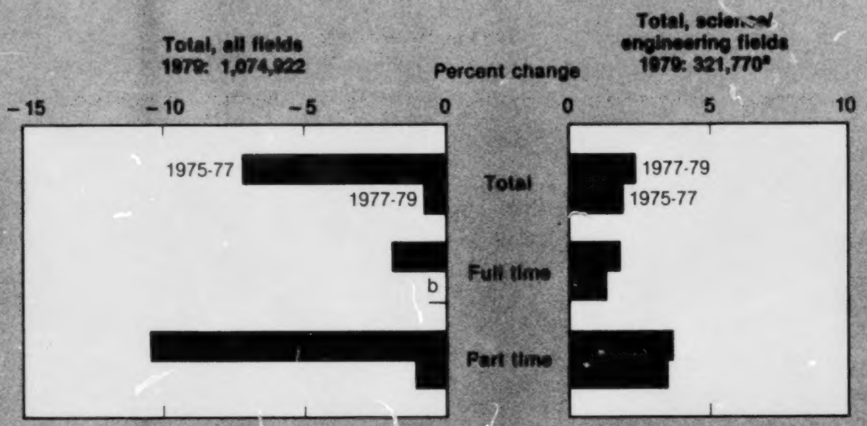
[42] A further discussion of these problems is presented in National Association of Foreign Student Affairs, *The Relevance of U.S. Graduate Programs to Foreign Students for Developing Countries* (Washington, D.C., April 1979).

[43] National Science Foundation, *Foreign Participation in U.S. Science and Engineering Higher Education and Labor Markets* (NSF 81-316) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1981).

[44] Andrew J. Pepin, *Fall Enrollment in Higher Education, 1979* (NCES 80-349) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1980), p. 4.

Chart 44. Graduate enrollment by field and status



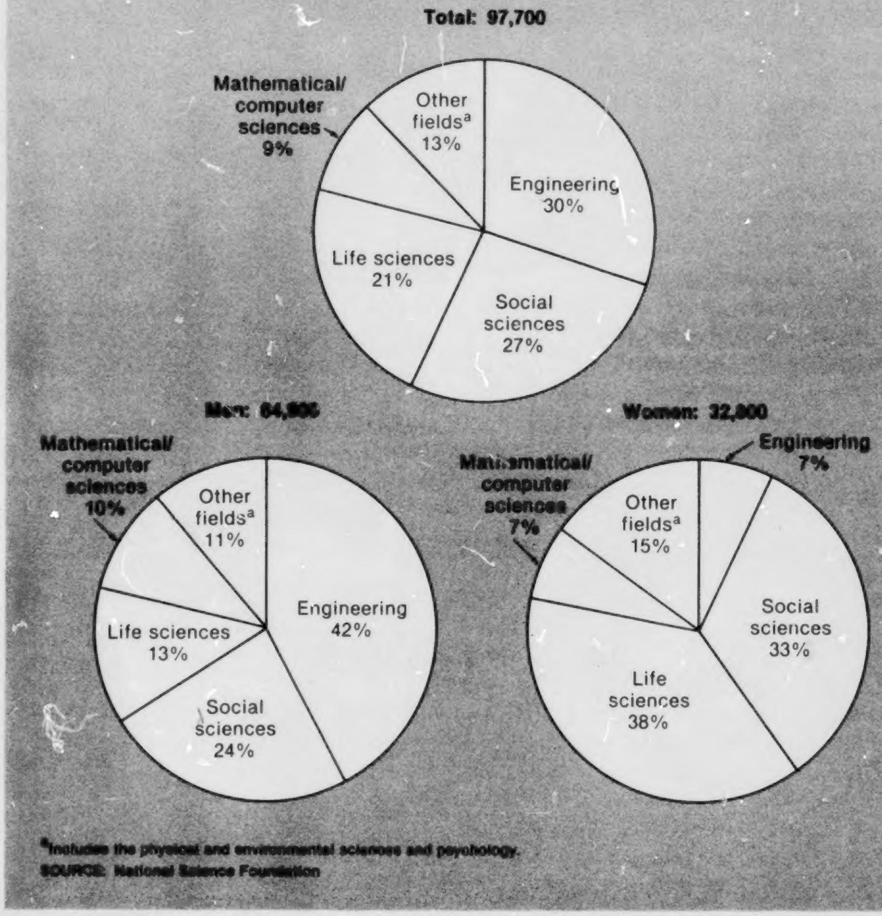
[a] At doctorate-granting institutions.

[b] Less than 0.5 percent change.

SOURCES: National Center for Education Statistics (HEW) and National Science Foundation

The ratio of women to men among part-time S/E graduate students was nearly the same as among full-time students, about one to two. Men differed sharply from women in terms of field of concentration, however. Among men the largest number was in engineering courses (42 percent) while more women were enrolled in the life sciences (38 percent) than in any other field. The social sciences ranked second among both sexes, with 24 percent of the men and 33 percent of the women enrolled in this area (table B-50 and chart 45). Because of the lack of trend data on part-time S/E graduate students by sex, it is not yet possible to determine whether the distributions of men and women by field are becoming more or less similar over time. Given the distribution of employment opportunities among fields, however, it is likely that fewer students of both sexes will make the social sciences their field of specialization, while enrollment of both men and women in such fields as engineering and the mathematical/computer sciences will increase. Since ample employment opportunities in industry are available in these latter two fields, this is apt to be even more true for part-time students than for full-time.

Chart 45. Part-time graduate science/engineering enrollment in doctorate-granting institutions by field and sex: fall 1979



[a] Includes the physical and environmental sciences and psychology.

SOURCE: National Science Foundation

appendixes

a. technical notes
b. detailed statistical tables
c. reproduction of survey instruments, fy 1979

appendix a

technical notes

survey of scientific and engineering expenditures at universities and colleges, fy 1979

On January 24, 1980, survey questionnaires were mailed to 567 universities and colleges offering a doctorate or master's degree in the sciences and engineering, and to all other institutions with $50,000 or more in separately budgeted R&D expenditures. In addition, 19 FFRDC's were surveyed separately. The institutions surveyed are estimated to account for over 99 percent of all academic R&D expenditures. The criteria for establishing the survey universe is essentially the same as in FY 1977.

The FY 1979 survey was conducted on a "full-scale" or long-form basis and followed essentially the same format used in FY 1977. In the continuing effort to provide statistical information of importance to Federal and academic planners, NSF modified portions of the 1979 questionnaire. The instruction and departmental research item was deleted and replaced with a new optional item on separately budgeted current fund expenditures for S/E equipment used in research projects. It was identified as "optional" in order to provide a year's leadtime to respondents to prepare for any significant change or addition to the survey form. Accurate data on research equipment are not readily available in most institutions' central recordkeeping systems and many schools could not repond readily to this item in FY 1979. During the survey cycle, respondents indicated these data would be available in the future, since many institutions are revising their recordkeeping procedures in compliance with the new Federal reporting requirements to provide more detailed inventory records on scientific apparatus.

In an effort to decrease the respondent reporting burden, NSF conducted an abbreviated or short-form survey during FY 1978, mailed to doctorate-granting institutions only. Respondents subsequently have indicated, however, that since the record systems and computer programs used to respond to NSF surveys had already been developed to supply all the data needed on a long form, no real reduction in the burden was achieved by alternating with a short form. Therefore, NSF decided to resume use of the standardized annual form for the entire universe and plans to maintain consistency to the extent possible.

At closeout of the survey in late July 1980, 510 institutions, or 90 percent of the universe, had responded, including 99 of the top 100 institutions. Table A-1 shows a distribution of the institutional response rates by highest degree granted. The final data tabulations are available in *Academic Science: R&D Funds, Fiscal Year 1979* (Detailed Statistical Tables) (NSF 81-301).

Table A-1. Response rates to survey of academic R&D expenditures by highest degree granted: FY 1979

Highest degree granted	Number surveyed	Number of respondents	Percent of total
Total	567	510	89.9
Doctorate ...	320	301	94.1
Master's	179	152	84.9
Bachelor's and no science degree	68	57	83.8

Source: National Science Foundation

imputation for nonresponse

Approximately 10 percent of the survey universe had not responded at the survey closeout in July 1980. The computer program developed to estimate data for these nonrespondent institutions is referred to as "imputation" and is based on key data elements reported in the institutions' prior years' response, when available. Each phase of the FY 1979 imputation process used detailed summary data according to the respondent institutions' characteristics (highest degree granted and type of control) to determine inflation or deflation factors. These factors were applied to respondents' previous years data; however, because only doctorate-granting institutions were surveyed in FY 1978, data for all other nonrespondent schools were estimated based on inflation or deflation factors applied to their FY 1977 responses.

Table A-2 shows total and estimated or imputed separately budgeted R&D expenditures and the percentage of total which was estimated.

In the absence of a reliable R&D cost index, constant-dollar figures are derived by using the GNP implicit price deflators calculated by the Department of Commerce, as modified by NSF to reflect a fiscal year basis. Table A-3 shows the factors used in calculating constant 1972 dollars for all years from 1972 through 1982.

response analysis and data quality

NSF's effort to reduce the institutional reporting burden of surveys by changing to a biennial cycle utilizing an abbreviated form in alternate years failed to give any significant relief. Large institutions that responded to both the long form and short form reported that little if any reduction was achieved in the reporting burden since most of these schools had incorporated into their systems the requirements for completing the long form. Notable response problems, however, arose for the smaller nondoctorate schools, resulting in an overall lowering of the response rate and a slowdown in the timeliness of responses. For example, during the short-form cycle, 1978, when only doctorate-granting institutions were surveyed, a response rate of 96 percent was attained, generally the same as in previous long-form years. During 1979, however, when the full universe was surveyed, the response rate dropped to 90 percent, primarily as a result of the declining response rates of nondoctorate schools. NSF learned that the reason for this reduction was that most of the institutions which were not surveyed in 1978 had reallocated their personnel and the time to complete the survey forms. When requested in 1979 to fill out the questionnaire, these resources were often no longer available. Respondents from both doctorate-granting and nondoctorate-granting schools indicated their preference for a standard, consistent format each year. Therefore, NSF will no longer use a short-form questionnaire with an abbreviated universe; the survey effort has returned in 1980 to the former full-scale data collection procedure used through 1977.

Table A-2. Imputation rates to survey of academic R&D expenditures by highest degree granted: FY 1979

[Dollars in millions]

Highest degree granted	Separately budgeted R&D expenditures	Amount imputed and/or estimated	Percent of total
Total	$5,183	$202	3.9
Doctorate	5,093	183	3.6
Master's	69	13	18.8
Bachelor's and no science degree	21	6	28.6

Source: National Science Foundation

Table A-3. Gross national product (GNP) implicit price deflators used in the calculation of constant 1972 dollars in this report

Year	Factor
1972	1.000
1973	1.044
1974	1.119
1975	1.231
1976	1.317
1977	1.406
1978	1.500
1979	1.628
1980	1.767
1981	1.944
1982	2.113

Source: Department of Commerce, adjusted to a fiscal-year basis by the National Science Foundation.

Additional questions regarding the findings from the Survey of Scientific and Engineering Expenditures at Universities and Colleges should be addressed to James B. Hoehn or M. Marge Machen, Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550 (202-634-4673). Data tapes for FY 1979 and prior years may be purchased from:

Moshman Associates, Inc.
6400 Goldsboro Road
Washington, D.C. 20034
(301) 220-3000

survey of scientific and engineering personnel at universities and colleges, january 1980

Survey questionnaires were mailed in mid-February 1980 to more than 2,200 institutions of higher education and 19 university-administered FFRDC's. The survey universe included all institutions of higher education, including 2-year institutions, that were identified by NSF as offering degree-credit courses in either the sciences or engineering.

At the survey closeout date in mid-September 1980, the survey population included 2,247 universities and colleges and 19 university-associated FFRDC's. This adjustment reflected curriculum modifications, i.e., addition or termination of S/E programs, as well as changes in the institutional population. Of this total, 1,364 or 61 percent responded, compared with 79-percent response rate for the previous full-scale survey in January 1978. General expressions of concern about "paperwork burden" related to the change from a short to a long form and increased workloads of academic support staff appear to have contributed to the decline in the response rate.

Specific changes to the survey form were made in January 1980: (1) Highest earned degrees of professional S/E staff were requested by employment status rather than by function in which primarily employed; (2) a question relating to part-time employment of men and women by field was added; (3) the item on technicians was deleted; and (4) FTE's became the only measure of separately budgeted R&D involvement. Even though the FTE concept provided a more sensitive measure of academic R&D involvement, many institutions have indicated that their records do not readily yield data in this format.

The majority of nonrespondents in 1980 were small institutions. Of the 326 Ph. D.-granting institutions, only 56 were nonrespondents. Response rates are shown in table A-4.

Table A-4. Response rates to survey of scientific and engineering personnel by highest degree granted: January 1980

Highest degree granted	Number surveyed	Number of respondents	Percent of total
Total	2,247	1,364	60.7
Doctorate ...	326	270	82.8
Master's	320	282	88.1
Bachelor's and no science degree	1,601	812	50.7

Source: National Science Foundation

estimates for nonresponse

In order to develop national totals of academic employment of scientists and engineers, estimates were made by NSF for institutions that failed to respond by the close of the survey in mid-September 1980. These "imputations" for nonrespondents were based upon key item totals reported or estimated in the 1978 full-scale survey cycle. Totals for these institutions were inflated or deflated according to overall rates of changes reported by institutions at the same degree level and type of control (public or private). Detailed imputations were then made on the basis of the distribution computed for similar institutions, a method that has been used in the survey since 1977.

The combined imputed and estimated amounts totaled 69,600, or 21 percent of the total academic S/E force (table A-5). The largest imputation rates occurred for data collected on the number of FTE scientists and engineers involved in separately budgeted R&D activities. Imputations and estimations accounted for 25 percent of the R&D-engaged FTE total. During the last four survey cycles, steady improvement has occurred in the reporting of research involvement of S/E professionals, as universities' record systems have evolved to provide these data by field.

Table A-5. Estimated and/or imputed amounts for scientists and engineers employed at universities and colleges: January 1980

Disciplines	Total	Full time	Part time	Total FTE's[1]	FTE's devoted to separately budgeted R&D
Scientists and engineers, total ...	69,646	51,653	19,661	76,287.7	13,981.3
Engineers, total ...	5,919	4,233	1,673	6,405.1	1,541.2
Aeronautical & astronautical engineers ...	233	191	42	250.2	159.4
Chemical engineers ...	283	218	65	365.4	124.8
Civil engineers ...	1,031	716	315	1,022.3	142.2
Electrical engineers ...	1,728	1,223	505	1,672.0	429.4
Mechanical engineers ...	1,288	934	348	1,266.7	193.0
Other engineers ...	1,622	1,154	461	1,733.5	482.4
Physical scientists, total ...	8,104	6,442	1,662	8,488.3	1,720.2
Chemists ...	4,475	3,473	1,008	4,638.3	739.7
Physicists ...	2,918	2,408	511	3,123.4	751.3
Astronomers ...	51	44	7	92.0	41.1
Other physical scientists ...	510	379	133	472.6	161.1
Environmental scientists, total ...	1,609	1,240	369	1,833.3	514.1
Earth scientists ...	1,282	1,006	284	1,346.9	234.5
Atmospheric scientists ...	112	79	33	96.9	45.3
Oceanographers ...	181	137	44	337.3	202.1
Other environmental scientists ...	19	11	8	37.2	32.2
Mathematical scientists, total ...	9,740	6,447	3,285	9,223.4	622.8
Mathematicians ...	7,735	5,203	2,526	7,275.7	397.7
Computer scientists ...	2,002	1,192	808	1,869.7	225.1
Life scientists, total ...	23,163	18,014	5,149	25,197.8	7,937.6
Agricultural scientists ...	1,456	1,179	277	1,803.7	540.4
Biological scientists ...	9,590	7,769	1,835	10,324.4	3,068.1
Medical scientists ...	10,920	8,202	2,704	11,911.5	4,162.1
Other life scientists ...	494	430	64	626.3	162.0
Psychologists, total ...	7,060	4,582	2,501	6,517.1	442.9
Social scientists, total ...	14,520	9,862	4,650	13,882.0	946.6
Economists ...	3,711	2,326	1,384	3,544.1	297.3
Sociologists ...	4,246	2,813	1,429	3,982.9	224.9
Political scientists ...	3,221	2,357	861	3,188.6	166.2
Other social scientists ...	3,315	2,317	998	3,049.4	258.2

[1] Full-time-equivalents.

SOURCE: National Science Foundation

Beginning with the January 1979 survey, a 2-year cycle alternating short and long forms was initiated. Items on sex and degree level were deleted in the short-form years. The long-form/short-form cycle failed to lower the overall reporting burden of institutions, and in fact caused a disruption at many small institutions, resulting in an overall lowering of the response rate and a slowdown in the submission of responses. For example, the response rate during the January 1978 short-form survey cycle, which was mailed to 320 doctorate-granting institutions only, was

83 percent, about the same rate as reported in the prior long-form year. During the 1980 long-form survey cycle, however, the response rate dropped to 61 percent. This decline was primarily a result of a dropoff in responses from nondoctorate-granting institutions which had not been surveyed during the preceding short-form year. In tracing the reasons behind this decline, NSF staff learned that during the January 1979 survey, most of these institutions had reallocated their personnel, and in many of these institutions, staff resources were no longer available when the January 1980 questionnaire arrived on campus.

Respondents at doctorate-granting institutions, which were surveyed in both the long-form and short-form years, indicated that no real reduction had occurred in their reporting burden, and although no significant decline in response rate occurred among doctorate-granting institutions, these schools generally indicated their preference for a more consistent survey format each year. NSF will therefore no longer use a short-form questionnaire with an abbreviated universe for the S/E personnel survey; the survey effort will return in January 1981 to the former full-scale, long-form data collection effort used through 1978.

Requests for additional information concerning the personnel survey findings should be addressed to Mr. James Hoehn or Mrs. Esther Gist, Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550 (202-634-4673). Data tapes for January 1980 and prior years may be purchased from:

Moshman Associates, Inc.
6400 Goldsboro Road
Washington, D.C. 20034
(301) 229-3000

survey of graduate science students and postdoctorals, fall 1979

Questionnaires for the fall 1979 survey were mailed to 437 reporting units at 322 doctorate-granting institutions and to 315 master's-granting institutions by January 4, 1980. The closeout data for survey response was July 9, 1980, by which time all but 14 institutions—6 doctorate-granting institutions and 8 master's-granting—had submitted responses.

imputation for nonresponse

In order to arrive at universe totals, data were estimated for institutions or departments which failed to return questionnaires. Item totals for which the institutions were unable to provide data were estimated on the basis of the institution's response in the previous survey, inflated or deflated by a factor derived from those departments of the same degree level and type of control responding to both surveys. Detailed data within the item were then imputed on the basis of that department's previous response. The response rates at the institutional and departmental level are shown in table A-6.

The responding departments accounted for almost all the graduate students and postdoctorates included in the report; estimates made up only 3 percent of the total. Table A-7 shows the proportion of the total shown in this publication which was imputed, by level of institution (either doctorate- or master's-granting), for S/E graduate students and for postdoctorates.

expansion of the survey system

One factor contributing significantly to the difficulty of comparing current data with prior years' data lies in the gradual growth of the universe of the survey system. The present Survey of Graduate Science Students and Postdoctorates is an outgrowth of the departmental application forms which were filled out as part of NSF's Graduate Traineeship Program between 1967 and 1971. Completion of these Departmental Data Sheets was required of departments participating in the program. In 1972, the survey coverage was expanded to include all S/E departments in all doctorate-granting institutions, and in 1975 an abbreviated questionnaire was designed to gather data on S/E departments in master's-granting institutions as well. In 1978, the short form was sent to doctorate-granting institutions only; in 1979, the short form was discontinued and for the first time the same data were collected for all graduate S/E departments, whether in doctorate- or master's-granting institutions. The survey therefore provides only partial data on master's-granting institutions for 1975 through 1977 and complete data to compare with doctorate-granting institutions beginning in 1979.

response analysis and data quality

To determine the accuracy of the reporting in the survey series, two studies have been conducted in recent years. The first of these, in 1974, consisted of a series of personal visits and structured interviews at 120 S/E departments in 30 institutions;[1] the second, in 1978, consisted of campus interviews at 45 major research universities. Both of these studies indicated that records needed for institutional responses to

Table A-6. Institutional and departmental response rates to the survey of graduate science students and postdoctorates by highest degree granted: Fall 1979

Type of institution	Institutions			Departments		
	Number surveyed	Number of respondents	Percent of total	Number surveyed	Number of respondents	Percent of total
Total	637	623	97.8	9,815	9,465	96.4
Doctorate	322	316	98.1	8,363	8,070	96.6
Master's	315	307	97.5	1,452	1,395	95.5

SOURCE: National Science Foundation

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[1] Westat, Inc., Assessment of Coverage, Consistency of Reporting and Methodology of the 1973 Graduate Science Student Support Survey: A Reliability and Validity Study. (Rockville, Md., 1975).

Table A-7. Proportions of totals imputed, by highest degree granted and enrollment status: 1979

Highest degree	S/E graduate students									Postdoctorates		
	Total			Full time			Part time					
	Total	Number reported	Percent imputed	Total	Number reported	Percent imputed	Total	Number reported	Percent imputed	Total	Number reported	Percent imputed
All institutions	375,267	363,970	3.0	243,331	237,057	2.6	131,936	126,913	3.8	18,639	18,003	3.4
Doctorate-granting	321,770	312,191	3.0	224,057	218,500	2.5	97,713	93,691	4.1	18,589	17,953	3.4
Master's-granting	53,497	51,779	3.2	19,274	18,557	3.7	34,223	33,222	2.9	50	50	.0

SOURCE: National Science Foundation

the GSSP survey are much more decentralized than those of the expenditures or personnel surveys. Questionnaires are filled out primarily at the department level, where data on sources of support of graduate students and postdoctorates are most likely to be available. The level of accuracy, however, may vary considerably from department to department, even within a given institution.

Since 1978, institutional personnel have increasingly been brought into the data editing phase of all three academic science surveys as well as the Survey of Federal Support to Universities computer-generated "Institutional Profiles." The respondents are given the opportunity to make modifications or corrections not only to the current year's data but also to the data shown for earlier years in the survey series. The trend data shown in the current report, therefore, supersede totals published in previous reports.

Requests for additional information concerning the Survey of Graduate Science Students and Postdoctorates should be addressed to Mr. J. G. Huckenpahler, Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550 (202-634-4673). Data types for fall 1979 and earlier years may be purchased from:

NSF Surveys
Abt Associates, Inc.
55 Wheeler Street
Cambridge, Massachusetts 02138
(617) 492-7100

the data user guide

In order to inform potential users of the types of institutional data available through the multi-survey data base, Moshman Associates, Inc., has developed and periodically updates a "Data User Guide." Copies of the latest edition, dated January 1980, and the January 1981 Addendum may be obtained free of charge by writing to:

Universities and Nonprofit
Institutions Studies Group
National Science Foundation
Room L-602
1800 G Street, N.W.
Washington, D.C. 20550

appendix b

detailed statistical tables

R&D Expenditures

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TABLE B-1. — NATIONAL R&D EXPENDITURES BY SECTOR: 1972-81 (EST.)

(DOLLARS IN MILLIONS)

YEAR	TOTAL	FEDERAL GOVERNMENT	INDUSTRY	NONPROFIT INSTITUTIONS	ACADEMIC SECTOR	
					UNIVERSITIES AND COLLEGES	ASSOCIATED FFRDC'S 1/
1972	$28,429	$4,542	$19,552	$952	$2,630	$753
1973	30,665	4,709	21,249	1,006	2,884	817
1974	32,814	4,861	22,887	1,178	3,023	865
1975	35,169	5,310	24,187	1,276	3,409	987
1976	38,935	5,688	26,997	1,376	3,727	1,147
1977	42,923	6,053	29,928	1,495	4,063	1,384
1978	48,023	6,856	33,164	1,672	4,614 2/	1,717
1979	54,215	7,497	37,606	1,994	5,183	1,935
1980 (PRELIM.)	61,137	8,052	42,750	2,175	5,950	2,200
1981 (EST.)	69,065	8,965	49,150	2,350	6,300	2,300

1/ FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS.
2/ ESTIMATE BASED ON DATA COLLECTED FOR DOCTORATE-GRANTING INSTITUTIONS ONLY.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-2. — NATIONAL BASIC RESEARCH EXPENDITURES BY PERFORMER: 1972-81 (EST.)

(DOLLARS IN MILLIONS)

YEAR	TOTAL	FEDERAL GOVERNMENT	INDUSTRY	UNIVERSITIES AND COLLEGES 1/	ALL OTHER
1972	$3,788	$584	$593	$2,022	$589
1973	3,924	586	631	2,053	654
1974	4,207	664	699	2,154	690
1975	4,575	701	730	2,410	734
1976	4,928	738	819	2,548	823
1977	5,485	867	911	2,795	912
1978	6,318	973	1,028	3,165 2/	1,152
1979	7,164	1,026	1,188	3,552	1,398
1980 (PRELIM.)	8,132	1,097	1,350	4,065	1,620
1981 (EST.)	8,772	1,172	1,550	4,300	1,750

1/ EXCLUDES FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS (FFRDC'S).
2/ ESTIMATE BASED ON DATA COLLECTED FROM DOCTORATE-GRANTING INSTITUTIONS ONLY.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-3. — R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES BY CHARACTER OF WORK: FISCAL YEARS 1972-79

(DOLLARS IN MILLIONS)

FISCAL YEAR	BASIC RESEARCH		APPLIED RESEARCH AND DEVELOPMENT	
	CURRENT	CONSTANT 1/	CURRENT	CONSTANT 1/
1972	$2,022	$2,022	$608	$608
1973	2,053	1,967	831	796
1974	2,154	1,925	869	777
1975	2,410	1,958	999	812
1976	2,548	1,935	1,180	896
1977	2,795	1,988	1,268	902
1978 2/	3,165	2,110	1,449	966
1979	3,552	2,182	1,631	1,002

1/ BASED ON GNP IMPLICIT PRICE DEFLATOR IN 1972 DOLLARS.
2/ ESTIMATE BASED ON DATA COLLECTED FROM DOCTORATE-GRANTING INSTITUTIONS ONLY.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-4. — FEDERAL OBLIGATIONS TO UNIVERSITIES AND COLLEGES FOR RESEARCH AND DEVELOPMENT BY AGENCY AND BROAD SCIENCE/ENGINEERING FIELD: FY 1979

(DOLLARS IN THOUSANDS)

AGENCY	TOTAL, ALL FIELDS	ENGINEERING	PHYSICAL SCIENCES	ENVIRONMENTAL SCIENCES	MATHEMATICAL & COMPUTER SCIENCES	LIFE SCIENCES	PSYCHOLOGY	SOCIAL SCIENCES	OTHER SCIENCES, N.E.C.
TOTAL, ALL AGENCIES	$3,846,321	$570,459	$450,653	$337,333	$69,999	$2,010,970	$90,998	$207,001	$108,908
DEPARTMENT OF AGRICULTURE	193,842	7,471	11,131	1,866	390	146,531	0	26,453	0
DEPARTMENT OF COMMERCE	45,853	2,402	2,012	37,582	338	608	0	2,828	83
DEPARTMENT OF DEFENSE	528,720	352,874	53,166	35,147	19,157	43,995	5,684	540	18,157
DEPARTMENT OF ENERGY	256,389	46,977	109,136	65,391	370	21,091	4,794	602	8,028
ENVIRONMENTAL PROTECTION AGENCY .	60,898	3,990	5,894	12,339	264	30,907	0	875	6,629
DEPT OF HEALTH, EDUCATION, & WELFARE, TOTAL	1,965,781	36,317	51,295	0	6,409	1,624,560	70,490	120,822	55,888
NAT'L INSTITUTES OF HEALTH	1,720,254	32,039	43,369	0	4,307	1,552,633	33,776	10,932	43,198
OTHER HEW	245,527	4,278	7,926	0	2,102	71,927	36,714	109,890	12,690
DEPT OF HOUSING & URBAN DEV	3,976	0	0	0	0	0	0	3,976	0
DEPARTMENT OF THE INTERIOR	35,315	10,036	1,010	12,124	1,863	6,427	67	3,788	0
AGENCY FOR INTERNAT'L DEV	27,979	250	0	0	0	25,350	0	2,379	0
DEPARTMENT OF LABOR	11,118	0	0	0	0	0	0	11,118	0
NAT'L AERONAUTICS & SPACE ADMIN .	137,215	24,563	58,573	40,153	1,490	8,762	677	149	2,848
NATIONAL SCIENCE FOUNDATION	561,320	72,394	156,965	129,621	39,624	102,684	9,286	33,471	17,275
NUCLEAR REGULATORY COMMISSION ...	6,485	1,755	1,471	3,113	94	55	0	0	0
DEPARTMENT OF TRANSPORTATION	11,430	11,430	0	0	0	0	0	0	0

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-5. — R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES BY SOURCE: FISCAL YEARS 1972-79

(DOLLARS IN MILLIONS)

FISCAL YEAR	TOTAL		FEDERAL		NON-FEDERAL	
	CURRENT	CONSTANT 1/	CURRENT	CONSTANT 1/	CURRENT	CONSTANT 1/
1972	$2,630	$2,630	$1,795	$1,795	$835	$835
1973	2,884	2,762	1,985	1,901	899	861
1974	3,023	2,702	2,032	1,816	991	886
1975	3,409	2,769	2,288	1,858	1,121	911
1976	3,727	2,830	2,512	1,907	1,215	923
1977	4,063	2,890	2,729	1,941	1,334	949
1978 2/............	4,614	3,076	3,057	2,038	1,557	1,038
1979	5,183	3,184	3,432	2,108	1,751	1,076

1/ BASED ON GNP IMPLICIT PRICE DEFLATOR IN 1972 DOLLARS.
2/ ESTIMATE BASED ON DATA COLLECTED FROM DOCTORATE-GRANTING INSTITUTIONS ONLY.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-6. — R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES BY SOURCE OF FUNDS, CHARACTER OF WORK, AND SCIENCE/ENGINEERING FIELD: FISCAL YEARS 1972-79

(DOLLARS IN THOUSANDS)

SOURCE, CHARACTER, AND FIELD	1972	1973	1974	1975	1976	1977	1978 1/	1979
TOTAL	$2,630,442	$2,883,958	$3,022,642	$3,408,616	$3,727,286	$4,063,233	$4,614,053	$5,182,729
SOURCE OF FUNDS:								
FEDERAL GOVERNMENT	1,795,045	1,985,386	2,032,204	2,287,844	2,511,603	2,729,181	3,056,875	3,431,538
STATE AND LOCAL GOVERNMENTS	269,582	294,572	306,881	331,642	363,024	373,192	413,546	467,311
INDUSTRY	74,413	83,968	95,953	112,988	123,113	138,789	169,598	193,794
INSTITUTIONAL FUNDS	304,789	318,289	369,689	417,453	444,994	507,539	614,965	716,241
ALL OTHER SOURCES	186,613	201,743	217,915	258,689	284,552	314,532	359,069	373,845
CHARACTER OF WORK:								
BASIC RESEARCH	2,022,150	2,053,140	2,153,952	2,409,819	2,547,578	2,795,148	3,165,036	3,552,074
APPLIED RESEARCH AND DEVELOPMENT	608,292	830,818	868,690	998,797	1,179,708	1,268,085	1,449,017	1,630,655
FIELD:								
ENGINEERING	341,362	333,129	346,905	380,970	431,735	498,473	601,062	715,454
PHYSICAL SCIENCES	324,222	328,262	333,479	350,327	379,429	427,319	495,281	559,566
ASTRONOMY	21,596	24,114	24,427	26,611	26,294	32,361	36,782	39,026
CHEMISTRY	108,122	113,687	115,777	120,726	140,153	163,628	182,428	204,062
PHYSICS	159,067	167,013	169,250	173,538	183,067	201,330	234,742	275,680
OTHER, N.E.C.	35,437	23,448	24,025	29,452	29,915	30,000	41,329	40,798
ENVIRONMENTAL SCIENCES	189,021	209,385	235,072	255,079	286,887	317,507	377,548	429,129
MATHEMATICAL/COMPUTER SCIENCES	69,322	72,741	76,709	85,319	86,997	106,579	124,597	145,087
COMPUTER SCIENCES 2/	-	35,657	39,202	45,600	44,505	55,177	66,933	79,450
MATHEMATICS 2/	-	37,084	37,507	39,719	42,492	51,402	57,664	65,637
LIFE SCIENCES	1,329,320	1,529,808	1,631,778	1,901,100	2,101,629	2,257,381	2,535,329	2,814,824
AGRICULTURAL SCIENCES 3/	227,079	276,870	347,514	383,855	412,868	460,647	497,662	565,697
BIOLOGICAL SCIENCES	443,473	556,676	510,210	630,263	710,657	771,096	857,969	949,993
MEDICAL SCIENCES	594,574	645,709	716,080	811,524	897,376	950,907	1,093,499	1,214,442
OTHER, N.E.C.	64,194	50,553	57,974	75,458	80,728	74,731	86,199	84,692
PSYCHOLOGY	69,188	73,742	74,236	79,872	77,887	84,517	89,035	99,732
SOCIAL SCIENCES	202,792	231,115	240,617	256,114	262,260	265,828	274,723	290,057
ECONOMICS	45,784	47,628	47,685	55,936	65,440	71,383	78,927	85,415
POLITICAL SCIENCE	21,396	25,504	27,017	29,386	28,353	32,167	35,869	39,029
SOCIOLOGY	58,451	61,514	63,447	68,755	66,240	61,119	65,804	72,669
OTHER, N.E.C.	77,161	96,469	102,468	102,037	102,227	101,159	94,123	92,944
OTHER SCIENCES, N.E.C.	105,215	105,776	83,846	99,835	100,462	105,629	116,478	128,880

1/ ESTIMATE BASED ON DATA COLLECTED FROM DOCTORATE-GRANTING INSTITUTIONS ONLY.
2/ NOT SEPARATELY AVAILABLE PRIOR TO 1973.
3/ ESTIMATED FOR 1972 AND 1973, BASED ON DATA COLLECTED IN 1974.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-7. — FEDERALLY FINANCED R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES BY CHARACTER OF WORK AND SCIENCE/ENGINEERING FIELD: FISCAL YEARS 1972-79

(DOLLARS IN THOUSANDS)

CHARACTER AND FIELD	1972	1973	1974	1975	1976	1977	1978 1/	1979
TOTAL	$1,795,045	$1,985,386	$2,032,204	$2,287,844	$2,511,603	$2,729,181	$3,056,875	$3,431,538
CHARACTER OF WORK:								
BASIC RESEARCH	1,420,164	1,453,916	1,523,115	1,695,212	1,841,027	2,008,640	2,261,907	2,517,992
APPLIED RESEARCH AND DEVELOPMENT	374,881	531,470	509,089	592,632	670,576	720,541	794,968	913,546
FIELD:								
ENGINEERING	252,876	238,139	239,346	259,384	290,519	336,725	407,487	474,866
PHYSICAL SCIENCES	261,010	268,368	270,211	285,026	305,413	342,718	392,304	448,992
ASTRONOMY	16,452	17,697	17,101	19,524	18,351	23,230	26,349	26,862
CHEMISTRY	82,564	86,560	88,703	92,726	107,871	125,389	137,959	154,031
PHYSICS	136,296	145,425	146,525	149,883	156,104	171,910	199,161	236,872
OTHER, N.E.C.	25,698	18,686	17,882	22,893	23,087	22,189	28,835	31,227
ENVIRONMENTAL SCIENCES	138,719	157,551	168,495	180,655	211,566	238,240	274,794	307,493
MATHEMATICAL/COMPUTER SCIENCES	51,938	53,685	58,107	65,108	65,808	78,178	85,344	94,534
COMPUTER SCIENCES 2/.......	-	24,929	28,711	33,880	32,926	37,546	41,214	45,491
MATHEMATICS 2/.............	-	28,756	29,396	31,228	32,882	40,632	44,130	49,043
LIFE SCIENCES	863,109	1,014,585	1,052,808	1,238,006	1,380,818	1,473,460	1,624,882	1,810,729
AGRICULTURAL SCIENCES 3/...	78,313	94,373	101,417	112,865	122,538	132,772	145,070	168,849
BIOLOGICAL SCIENCES	311,997	398,628	365,701	457,145	522,144	574,605	626,910	690,805
MEDICAL SCIENCES	438,093	486,045	543,663	613,785	677,509	712,327	791,067	890,612
OTHER, N.E.C.	34,706	35,539	42,027	54,211	58,627	53,756	61,835	60,463
PSYCHOLOGY	53,555	58,600	58,547	61,232	59,369	63,648	63,996	72,256
SOCIAL SCIENCES	111,215	132,420	136,824	141,344	138,263	138,205	140,445	153,674
ECONOMICS	20,440	22,683	22,217	26,971	29,132	31,595	37,103	40,641
POLITICAL SCIENCE	8,387	10,363	11,894	12,281	11,966	14,926	15,888	18,452
SOCIOLOGY	34,842	40,480	41,276	45,044	41,115	37,854	40,597	46,739
OTHER, N.E.C.	47,546	58,894	61,437	57,048	56,050	53,830	46,857	47,842
OTHER SCIENCES, N.E.C.	62,623	62,038	47,866	57,089	59,847	58,007	67,623	68,994

1/ ESTIMATE BASED ON DATA COLLECTED FROM DOCTORATE-GRANTING INSTITUTIONS ONLY.
2/ NOT SEPARATELY AVAILABLE PRIOR TO 1973.
3/ ESTIMATED FOR 1972 AND 1973, BASED ON DATA COLLECTED IN 1974.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-8. — R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES BY INSTITUTIONAL CONTROL: FISCAL YEARS 1972-79

(DOLLARS IN MILLIONS)

FISCAL YEAR	PUBLIC		PRIVATE	
	CURRENT	CONSTANT 1/	CURRENT	CONSTANT 1/
1972	$1,621	$1,621	$1,009	$1,009
1973	1,804	1,728	1,080	1,034
1974	1,912	1,709	1,110	992
1975	2,181	1,772	1,227	997
1976	2,409	1,829	1,318	1,001
1977	2,621	1,864	1,442	1,026
1978 2/..............	2,997	1,998	1,617	1,078
1979	3,366	2,068	1,816	1,115

1/ BASED ON GNP IMPLICIT PRICE DEFLATOR IN 1972 DOLLARS.
2/ ESTIMATE BASED ON DATA COLLECTED FROM DOCTORATE-GRANTING INSTITUTIONS ONLY.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-9. — R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES, BY SOURCE OF FUNDS, CHARACTER OF WORK, AND INSTITUTIONAL CONTROL: FISCAL YEAR 1979

(DOLLARS IN MILLIONS)

SOURCE AND CHARACTER OF WORK	TOTAL	PUBLIC	PRIVATE
TOTAL	$5,183	$3,366	$1,816
SOURCE OF FUNDS:			
FEDERAL	3,432	2,042	1,389
NONFEDERAL	1,751	1,324	427
CHARACTER OF WORK:			
BASIC RESEARCH	3,552	2,105	1,447
APPLIED RESEARCH AND DEVELOPMENT	1,631	1,262	369

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-10. — R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES BY GEOGRAPHIC DISTRIBUTION: FISCAL YEARS 1972-77 AND 1979 1/

(DOLLARS IN THOUSANDS)

DIVISION AND STATE	1972	1973	1974	1975	1976	1977	1979
TOTAL, ALL INSTITUTIONS ...	$2,630,442	$2,883,958	$3,022,642	$3,408,616	$3,727,286	$4,063,233	$5,182,729
NEW ENGLAND	280,755	279,361	292,585	329,736	361,316	403,153	523,597
CONNECTICUT	54,010	53,586	54,482	62,673	71,595	79,348	103,870
MAINE	5,985	6,688	7,115	8,759	9,632	9,937	12,593
MASSACHUSETTS	188,985	189,172	202,277	221,922	239,793	265,490	344,984
NEW HAMPSHIRE	7,659	8,774	7,273	10,063	11,963	13,705	17,890
RHODE ISLAND	17,647	13,869	13,565	15,730	16,166	21,543	30,229
VERMONT	6,469	7,272	7,873	10,589	12,167	13,130	14,031
MIDDLE ATLANTIC	485,200	530,807	549,495	608,774	650,778	697,917	864,925
NEW JERSEY	46,475	49,201	54,453	55,805	54,321	59,040	76,955
NEW YORK	309,110	348,891	344,506	389,842	409,314	436,836	538,533
PENNSYLVANIA	129,615	132,715	150,536	163,127	187,143	202,041	249,437
EAST NORTH CENTRAL	428,537	475,258	489,617	546,205	586,629	628,625	815,277
ILLINOIS	123,525	133,321	142,145	150,071	162,512	174,328	218,253
INDIANA	51,160	54,881	57,676	63,947	68,516	69,570	89,676
MICHIGAN	97,837	112,375	108,047	127,939	137,823	146,973	200,295
OHIO	72,734	77,156	82,153	93,963	108,391	121,230	162,108
WISCONSIN	83,281	97,525	99,596	110,285	109,387	116,524	144,945
WEST NORTH CENTRAL	219,686	219,641	236,760	263,966	292,494	321,789	397,979
IOWA	30,690	36,361	40,026	47,069	52,374	60,830	77,602
KANSAS	28,043	31,310	33,231	30,687	34,334	36,939	43,215
MINNESOTA	49,768	54,577	61,185	70,256	75,590	83,088	106,547
MISSOURI	78,493	65,555	67,391	74,226	81,309	88,176	104,831
NEBRASKA	19,830	18,316	20,687	24,882	28,305	30,820	40,746
NORTH DAKOTA	5,884	6,701	7,506	10,111	12,790	13,526	15,424
SOUTH DAKOTA	6,978	6,821	6,734	6,735	7,792	8,410	9,614
SOUTH ATLANTIC	322,363	362,072	389,497	448,017	489,625	534,207	672,324
DELAWARE	4,984	5,197	6,194	6,982	7,520	9,925	14,363
DISTRICT OF COLUMBIA	25,585	29,489	31,393	35,028	37,248	41,147	49,070
FLORIDA	65,468	73,428	76,742	87,590	98,401	105,002	120,447
GEORGIA	49,596	51,755	59,661	68,626	77,691	84,106	119,855
MARYLAND	63,392	70,843	79,045	89,935	93,583	102,599	125,515
NORTH CAROLINA	64,119	78,262	76,076	89,188	92,330	99,380	122,674
SOUTH CAROLINA	9,792	11,113	13,901	18,316	19,939	21,813	30,490
VIRGINIA	30,470	34,971	39,548	44,825	51,012	58,551	74,453
WEST VIRGINIA	8,957	7,014	6,937	7,527	11,901	11,684	15,457
EAST SOUTH CENTRAL	82,214	97,699	105,014	123,385	130,820	141,414	187,391
ALABAMA	22,116	27,005	31,066	37,918	37,870	42,340	55,913
KENTUCKY	14,236	16,667	17,334	21,414	22,938	27,620	37,994
MISSISSIPPI	16,646	19,023	21,999	23,909	26,195	25,445	35,119
TENNESSEE	29,216	35,004	34,615	40,144	43,817	46,009	58,365
WEST SOUTH CENTRAL	179,837	203,085	219,294	251,131	288,372	320,340	441,680
ARKANSAS	11,414	10,241	11,208	13,817	16,000	16,789	28,247
LOUISIANA	30,267	35,140	35,665	39,218	43,053	45,279	63,354
OKLAHOMA	19,247	20,028	19,106	21,513	23,156	26,289	35,081
TEXAS	118,909	137,676	153,315	176,553	206,163	231,983	314,998
MOUNTAIN	162,871	178,576	186,367	196,941	221,211	247,972	334,962
ARIZONA	23,911	30,321	31,164	33,539	37,198	41,827	67,125
COLORADO	59,399	63,997	62,585	65,897	73,308	77,519	104,564
IDAHO	8,084	8,727	10,600	11,877	13,704	15,215	13,985
MONTANA	6,756	9,771	9,614	10,831	13,254	14,168	17,993
NEVADA	6,085	6,449	7,537	7,824	9,404	9,043	12,616
NEW MEXICO	20,971	16,629	18,075	21,745	24,437	29,386	51,614
UTAH	32,005	36,004	39,635	37,500	40,789	49,742	57,297
WYOMING	5,660	6,678	7,157	7,728	9,117	11,072	9,768
PACIFIC	457,944	525,898	541,387	627,145	691,829	752,459	926,323
ALASKA	15,524	16,560	19,111	21,139	28,748	35,175	36,947
CALIFORNIA	323,834	380,220	391,995	458,436	500,756	537,838	662,485
HAWAII	23,520	24,846	21,143	24,596	28,049	28,900	35,703
OREGON	32,204	34,768	36,557	39,699	47,081	51,530	62,884
WASHINGTON	62,862	69,504	72,581	83,275	87,195	99,016	128,304
OUTLYING AREAS	11,035	11,561	12,626	13,316	14,212	15,357	18,271

1/ IN 1978, DATA WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-11. — FEDERALLY FINANCED R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES BY GEOGRAPHIC DISTRIBUTION: FISCAL YEARS 1972-77 AND 1979 1/

(DOLLARS IN THOUSANDS)

DIVISION AND STATE	1972	1973	1974	1975	1976	1977	1979
TOTAL, ALL INSTITUTIONS ...	$1,795,045	$1,985,386	$2,032,204	$2,287,844	$2,511,603	$2,729,181	$3,431,538
NEW ENGLAND ...	215,175	226,123	230,857	256,055	281,722	312,537	411,942
CONNECTICUT ...	38,345	38,913	40,203	45,530	53,780	58,917	77,597
MAINE ...	3,206	4,423	4,571	4,046	4,080	4,171	6,569
MASSACHUSETTS ...	149,369	158,286	163,070	177,892	191,615	210,723	279,354
NEW HAMPSHIRE ...	6,648	7,347	5,858	7,699	9,038	9,547	13,085
RHODE ISLAND ...	12,852	12,345	11,976	13,608	14,173	19,361	25,133
VERMONT ...	4,755	4,809	5,179	7,280	9,036	9,818	10,204
MIDDLE ATLANTIC ...	336,347	366,996	375,558	417,040	452,972	483,623	589,572
NEW JERSEY ...	27,250	29,567	28,821	32,375	32,553	34,847	44,692
NEW YORK ...	220,318	244,365	245,002	275,659	294,065	314,510	371,985
PENNSYLVANIA ...	88,779	93,064	101,735	109,006	126,354	134,266	172,895
EAST NORTH CENTRAL ...	278,674	315,281	315,137	345,137	377,499	403,569	511,377
ILLINOIS ...	83,693	97,765	100,843	106,551	116,558	127,336	147,669
INDIANA ...	35,042	39,824	40,329	43,916	45,800	47,353	60,462
MICHIGAN ...	67,276	71,087	67,850	78,622	78,115	84,453	112,110
OHIO ...	49,890	54,828	52,969	60,597	68,179	73,119	102,198
WISCONSIN ...	42,773	51,777	53,146	55,451	68,847	71,308	88,938
WEST NORTH CENTRAL ...	123,398	126,730	134,091	148,034	160,279	176,329	208,978
IOWA ...	17,727	20,407	21,768	25,139	26,769	31,334	40,960
KANSAS ...	17,433	20,050	20,542	16,762	17,330	18,998	17,371
MINNESOTA ...	28,504	31,395	35,463	42,065	45,238	48,628	61,398
MISSOURI ...	46,961	41,947	42,597	47,876	52,097	56,434	64,292
NEBRASKA ...	7,144	7,380	7,610	8,904	10,853	11,905	14,435
NORTH DAKOTA ...	2,121	2,541	3,108	4,373	4,791	5,722	6,307
SOUTH DAKOTA ...	3,508	3,010	3,003	2,915	3,201	3,308	4,215
SOUTH ATLANTIC ...	208,886	234,590	243,853	284,986	316,978	339,866	438,173
DELAWARE ...	3,158	3,078	3,177	3,652	4,348	5,544	8,117
DISTRICT OF COLUMBIA ...	21,600	23,755	24,630	26,284	28,685	30,442	36,078
FLORIDA ...	37,131	41,600	42,370	48,162	56,008	55,836	71,927
GEORGIA ...	22,983	24,979	24,977	33,072	38,403	43,297	62,786
MARYLAND ...	47,800	54,959	61,228	69,483	73,666	78,490	100,919
NORTH CAROLINA ...	46,847	55,079	53,246	62,896	65,335	69,284	82,010
SOUTH CAROLINA ...	4,763	4,922	6,294	7,773	8,958	11,084	15,655
VIRGINIA ...	18,260	21,333	23,594	28,106	33,742	39,437	51,833
WEST VIRGINIA ...	6,344	4,885	4,337	5,558	7,833	6,452	8,848
EAST SOUTH CENTRAL ...	53,670	65,853	67,865	78,236	80,612	84,353	103,289
ALABAMA ...	15,136	19,655	21,967	26,695	26,515	27,965	34,121
KENTUCKY ...	8,192	9,045	8,924	11,488	11,059	11,832	16,782
MISSISSIPPI ...	7,766	9,029	9,370	9,533	10,381	10,711	12,849
TENNESSEE ...	22,576	28,124	27,604	30,520	32,657	33,845	39,537
WEST SOUTH CENTRAL ...	103,997	112,489	120,792	141,949	161,721	183,996	240,433
ARKANSAS ...	6,191	4,825	4,346	5,281	6,639	7,807	7,677
LOUISIANA ...	13,863	14,448	15,820	17,156	18,603	19,460	24,055
OKLAHOMA ...	10,375	11,186	9,765	11,081	12,952	14,434	14,778
TEXAS ...	73,568	82,030	90,861	108,431	123,527	142,295	193,923
MOUNTAIN ...	115,474	122,406	123,333	135,956	150,355	165,150	219,328
ARIZONA ...	11,949	15,818	16,038	17,353	20,461	23,017	36,255
COLORADO ...	48,081	50,161	47,253	52,149	56,051	57,891	76,337
IDAHO ...	3,697	3,868	4,805	5,005	5,834	6,560	6,554
MONTANA ...	3,058	4,127	4,289	5,059	7,046	7,593	8,268
NEVADA ...	3,310	3,560	3,047	2,870	2,851	4,207	5,584
NEW MEXICO ...	18,275	12,919	14,779	18,095	20,218	22,942	37,842
UTAH ...	23,594	27,422	28,496	30,356	31,937	35,690	42,690
WYOMING ...	3,510	4,531	4,626	5,069	5,957	7,250	5,798
PACIFIC ...	355,127	410,426	415,761	474,860	522,873	572,487	698,616
ALASKA ...	11,204	11,822	10,718	12,047	18,429	24,664	25,431
CALIFORNIA ...	263,314	306,894	311,789	360,398	396,007	424,321	515,369
HAWAII ...	13,725	15,382	14,065	15,540	17,578	17,945	22,500
OREGON ...	21,832	24,007	25,458	27,090	30,930	32,890	39,311
WASHINGTON ...	45,052	52,321	53,731	59,785	59,929	72,667	96,005
OUTLYING AREAS ...	4,297	4,492	4,957	5,591	6,592	7,271	9,830

1/ IN 1978, DATA WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-12. — TOTAL AND FEDERALLY FINANCED CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING ACTIVITIES AT UNIVERSITIES AND COLLEGES BY SCIENCE/ENGINEERING FIELD: FISCAL YEARS 1972-77 AND 1979 1/

(DOLLARS IN THOUSANDS)

FIELD	1972	1973	1974	1975	1976	1977	1979
ALL SOURCES, TOTAL	$912,487	$835,862	$841,560	$1,016,402	$1,042,370	$959,491	$729,904
ENGINEERING	84,950	55,800	91,701	118,299	81,661	87,715	95,399
PHYSICAL SCIENCES	137,331	106,210	93,468	80,282	73,546	65,154	64,551
ENVIRONMENTAL SCIENCES	27,187	26,739	24,588	35,278	49,155	28,052	25,293
MATHEMATICAL/COMPUTER SCIENCES	24,712	20,016	23,670	15,042	24,677	25,126	27,465
LIFE SCIENCES	517,941	488,705	495,078	668,715	706,848	642,408	456,477
PSYCHOLOGY	19,007	39,584	15,511	11,525	9,129	12,699	7,803
SOCIAL SCIENCES	59,993	61,215	59,329	49,659	44,020	31,738	20,932
OTHER SCIENCES, N.E.C.	41,366	37,593	38,215	37,602	53,334	66,599	31,984
FEDERAL SOURCES, TOTAL	236,836	224,651	225,681	270,082	206,710	195,462	167,975
ENGINEERING	21,082	13,547	42,702	64,019	20,200	17,219	22,060
PHYSICAL SCIENCES	27,892	24,496	20,721	18,862	19,174	21,894	32,439
ENVIRONMENTAL SCIENCES	8,486	5,961	7,084	5,960	6,312	9,273	8,970
MATHEMATICAL/COMPUTER SCIENCES	4,341	3,022	4,257	2,584	2,048	1,882	3,049
LIFE SCIENCES	152,328	161,907	139,775	169,458	153,531	137,369	92,567
PSYCHOLOGY	3,663	5,119	2,536	2,245	1,967	2,398	1,767
SOCIAL SCIENCES	10,939	5,369	4,467	2,755	1,806	2,086	2,069
OTHER SCIENCES, N.E.C.	8,105	5,230	4,139	4,199	1,672	3,341	5,054
OTHER SOURCES, TOTAL	675,651	611,211	615,879	746,320	835,660	764,029	561,929
ENGINEERING	63,868	42,253	48,999	54,280	61,461	70,496	73,339
PHYSICAL SCIENCES	109,439	81,714	72,747	61,420	54,372	43,260	32,112
ENVIRONMENTAL SCIENCES	18,701	20,778	17,504	29,318	42,843	18,779	16,323
MATHEMATICAL/COMPUTER SCIENCES	20,371	16,994	19,413	12,458	22,629	23,244	24,416
LIFE SCIENCES	365,613	326,798	355,303	499,257	553,317	505,039	363,910
PSYCHOLOGY	15,344	34,465	12,975	9,280	7,162	10,301	6,036
SOCIAL SCIENCES	49,054	55,846	54,862	46,904	42,214	29,652	18,863
OTHER SCIENCES, N.E.C.	33,261	32,363	34,076	33,403	51,662	63,258	26,930

1/ DATA WERE NOT COLLECTED IN 1978.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-13. — TOTAL AND FEDERALLY FINANCED CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING ACTIVITIES AT UNIVERSITIES AND COLLEGES BY CONTROL: FISCAL YEARS 1972-77 AND 1979 1/

(DOLLARS IN THOUSANDS)

CONTROL	1972	1973	1974	1975	1976	1977	1979
ALL SOURCES, TOTAL	$912,487	$835,862	$841,560	$1,016,402	$1,042,370	$959,491	$729,904
PUBLIC	664,684	610,331	641,971	775,709	751,965	686,664	495,175
PRIVATE	247,803	225,531	199,589	240,693	290,405	272,827	234,729
FEDERAL SOURCES, TOTAL	236,836	224,651	225,681	270,082	206,710	195,462	167,975
PUBLIC	160,808	157,610	173,713	198,404	126,537	118,962	96,837
PRIVATE	76,028	67,041	51,968	71,678	80,173	76,500	71,138
OTHER SOURCES, TOTAL	675,651	611,211	615,879	746,320	835,660	764,029	561,929
PUBLIC	503,876	452,721	468,258	577,305	625,428	567,702	398,338
PRIVATE	171,775	158,490	147,621	169,015	210,232	196,327	163,591

1/ DATA WERE NOT COLLECTED IN 1978.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-14. — SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES BY SCIENCE/ENGINEERING FIELD AND STATUS: JANUARY 1973-78 AND 1980 1/

FIELD OF EMPLOYMENT AND STATUS	1973	1974	1975	1976	1977	1978	1980
ALL FIELDS	264,887	268,495	278,919	288,221	297,768	307,642	324,843
FULL TIME	216,424	218,407	223,336	229,823	236,192	242,063	255,659
PART TIME	48,463	50,088	55,583	58,398	61,576	65,579	69,184
ENGINEERS	27,530	27,198	27,919	28,505	30,096	31,002	33,772
FULL TIME	23,485	22,764	22,580	22,937	24,113	24,667	26,525
PART TIME	4,045	4.434	5,339	5,568	5,983	6,335	7,247
PHYSICAL SCIENTISTS	30,210	30,605	30,836	31,424	32,105	32,834	33,663
FULL TIME	26,666	26,849	26,662	27,077	27,541	27,890	28,100
PART TIME	3,544	3,756	4,174	4,347	4,564	4,944	5,563
ENVIRONMENTAL SCIENTISTS	6,934	7,636	7,855	8,432	9,218	9,492	9,789
FULL TIME	6,091	6,563	6,787	7,236	7,963	8,169	8,315
PART TIME	843	1,073	1,068	1,196	1,255	1,323	1,474
MATHEMATICAL AND COMPUTER SCIENTISTS	24,770	27,126	28,475	29,925	31,998	33,029	35,951
FULL TIME	20,794	22,157	22,404	23,134	23,874	24,349	26,049
PART TIME	3,976	4,969	6,071	6,791	8,124	8,680	9,902
LIFE SCIENTISTS	112,352	110,445	113,466	114,587	117,464	122,981	134,130
FULL TIME	88,418	88,497	90,684	91,879	94,325	97,749	108,619
PART TIME	23,934	21,948	22,782	22,708	23,139	25,232	25,511
PSYCHOLOGISTS	18,876	19,964	21,649	22,938	23,712	23,763	23,247
FULL TIME	14,777	14,957	15,973	16,805	17,316	17,413	16,756
PART TIME	4,099	5,007	5,676	6,133	6,396	6,350	6,491
SOCIAL SCIENTISTS	44,215	45,521	48,719	52,410	53,175	54,541	54,291
FULL TIME	36,193	36,620	38,246	40,755	41,060	41,826	41,295
PART TIME	8,022	8,901	10,473	11,655	12,115	12,715	12,996

1/ IN 1979, DATA WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-15. — DOCTORATE RECIPIENTS IN SCIENCE AND ENGINEERING BY FIELD: JUNE 1972-79

FIELD	1972	1973	1974	1975	1976	1977	1978	1979
TOTAL	19,556	19,555	19,086	19,048	18,790	18,281	17,956	18,247
ENGINEERS	3,475	3,338	3,144	2,959	2,791	2,641	2,423	2,494
PHYSICAL SCIENTISTS	3,646	3,439	3,126	3,055	2,858	2,719	2,611	2,675
ENVIRONMENTAL SCIENTISTS	650	662	674	695	714	691	623	646
MATHEMATICAL AND COMPUTER SCIENTISTS	1,281	1,222	1,196	1,149	1,003	959	959	977
LIFE SCIENTISTS	4,914	4,983	4,790	4,884	4,841	4,767	4,887	5,076
PSYCHOLOGISTS	2,262	2,444	2,587	2,749	2,878	2,960	3,049	3,081
SOCIAL SCIENTISTS	3,328	3,467	3,569	3,558	3,705	3,544	3,404	3,298

SOURCE: NATIONAL RESEARCH COUNCIL, SUMMARY REPORT, DOCTORATE RECIPIENTS FROM UNITED STATES UNIVERSITIES, JUNE 1972 THROUGH JUNE 1979, SURVEY OF EARNED DOCTORATES.

TABLE B-16. -- SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES BY TYPE OF INSTITUTION AND STATUS: JANUARY 1973-78 AND 1980 1/

TYPE OF INSTITUTION AND STATUS	1973	1974	1975	1976	1977	1978	1980
ALL INSTITUTIONS	264,887	268,495	278,919	288,221	297,768	307.642	324,843
FULL TIME	216,424	218,407	223,336	229,823	236,192	242,063	255,659
PART TIME	48,463	50,088	55,583	58,398	61,576	65,579	69,184
INSTITUTIONS GRANTING:							
DOCTORATE IN S&E	174,474	175,113	180,001	185,902	192,804	199,920	218,511
FULL TIME	143,393	144,525	147,942	153,719	159,575	164,445	180,433
PART TIME	31,081	30,588	32,059	32,183	33,229	35,475	38,078
MASTER'S IN S&E	28,703	29,765	34,075	33,143	34,790	38,762	37,436
FULL TIME	24,851	24,957	27,511	26,307	27,118	29,477	27,953
PART TIME	3,852	4,808	6,564	6,836	7,672	9,285	9,483
BACHELOR'S IN S&E	28,363	29,143	27,402	27,862	27,701	26,390	26,954
FULL TIME	23,620	23,940	22,548	22,867	22,615	21,253	20,788
PART TIME	4,743	5,203	4,854	4,995	5,086	5,137	6,166
OTHER DEGREES	1,348	1,322	1,345	1,033	607	858	864
FULL TIME	812	851	828	598	467	705	702
PART TIME	536	471	517	435	140	153	162
2-YEAR INSTITUTIONS	31,999	33,152	36,096	40,281	41,866	41,712	41,078
FULL TIME	23,748	24,134	24,5[illegible]	26,332	26,417	26,183	25,783
PART TIME	8,251	9,018	11,5[illegible]	13,949	15,449	15,529	15,295

1/ IN 1979, DATA WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-17. -- FULL-TIME EQUIVALENT (FTE) SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES BY TYPE OF ACTIVITY: JANUARY 1973-78 AND 1980 1/

TYPE OF ACTIVITY	1973	1974	1975	1976	1977	1978	1980	PERCENT CHANGE 1973-80
TOTAL FTE'S	235,050	238,055	244,381	252,555	258,966	271,560	282,173	20.0
RESEARCH AND DEVELOPMENT	46,896	47,952	51,171	52,916	54,408	55,919	57,116	21.8
OTHER ACTIVITIES	188,154	190,103	193,210	199,639	204,558	215,641	225,057	19.6

1/ IN 1979, DATA WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-18. -- BACHELOR'S- AND MASTER'S-DEGREE RECIPIENTS COMPARED TO EMPLOYMENT BY SCIENCE/ENGINEERING FIELD: 1977 AND 1979

FIELD OF SCIENCE/ENGINEERING	BACHELOR'S DEGREE RECIPIENTS, 1977	NUMBER EMPLOYED IN FIELD, 1979	PERCENT EMPLOYED	MASTER'S DEGREE RECIPIENTS 1977	NUMBER EMPLOYED IN FIELD, 1979	PERCENT EMPLOYED
TOTAL, ALL FIELDS	222,200	84,000	37.8	45,300	27,700	61.1
ENGINEERING	45,800	39,500	86.2	14,900	12,900	86.6
PHYSICAL SCIENCES	8,400	3,700	44.0	2,300	1,300	56.5
ENVIRONMENTAL SCIENCES	7,800	2,800	35.9	2,100	1,100	52.4
MATHEMATICAL/COMPUTER SCIENCES	18,100	10,800	59.7	5,600	3,200	57.1
COMPUTER SCIENCES	5,800	4,900	84.5	2,600	1,700	65.4
MATHEMATICS	12,300	5,900	48.0	3,000	1,500	50.0
LIFE SCIENCES	52,300	18,200	34.8	8,100	4,100	50.6
PSYCHOLOGY	36,300	4,000	11.0	6,400	3,300	51.6
SOCIAL SCIENCES	53,500	5,000	9.3	5,900	1,800	30.5

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-19. — FULL-TIME EQUIVALENT (FTE) SCIENTISTS AND ENGINEERS ENGAGED IN RESEARCH AND DEVELOPMENT AT UNIVERSITIES AND COLLEGES AND IN INDUSTRY: 1974-1980

YEAR	UNIVERSITIES AND COLLEGES	INDEX (1974=100)	INDUSTRY	INDEX (1974=100)
1974	47,952	100.0	360,000	100.0
1975	51,171	106.7	363,300	100.9
1976	52,916	110.3	364,400	101.2
1977	54,408	113.4	382,800	106.3
1978	55,919	116.6	403,700	112.1
1979	1/	1/	427,800	118.8
1980	57,116	119.1	2/	2/

1/ IN 1979, DATA WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS.
2/ INDUSTRY EMPLOYMENT DATA FOR 1980 NOT YET AVAILABLE.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-20. — FULL-TIME SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES BY FIELD OF EMPLOYMENT: JANUARY 1973-78 AND 1980 1/

FIELD OF EMPLOYMENT	1973	1974	1975	1976	1977	1978	1980
TOTAL	216,424	218,407	223,336	229,823	236,192	242,063	255,659
ENGINEERS	23,485	22,764	22,580	22,937	24,113	24,667	26,525
AERONAUTICAL AND ASTRONAUTICAL ENGINEERS	1,334	1,023	944	966	968	964	1,143
CHEMICAL ENGINEERS	1,529	1,522	1,603	1,637	1,680	1,722	1,898
CIVIL ENGINEERS	3,730	3,832	4,017	4,115	4,242	4,331	
ELECTRICAL ENGINEERS	5,916	5,393	5,409	5,466	5,596	6,399	
MECHANICAL ENGINEERS	4,455	4,255	4,355	4,353	4,470	4,532	4,804
OTHER ENGINEERS	6,521	6,801	6,453	6,555	7,414	7,611	7,950
PHYSICAL SCIENTISTS	26,666	26,849	26,662	27,077	27,541	27,890	28,100
ASTRONOMERS 2/	-	-	-	-	-	-	826
CHEMISTS	13,397	14,075	13,823	14,146	14,470	14,735	14,391
PHYSICISTS	11,077	10,870	10,940	10,838	11,059	11,268	11,417
OTHER PHYSICAL SCIENTISTS	2,192	1,904	1,899	2,093	2,012	1,887	1,466
ENVIRONMENTAL SCIENTISTS	6,091	6,563	6,787	7,236	7,963	8,169	8,315
ATMOSPHERIC SCIENTISTS	560	571	559	601	692	821	786
EARTH SCIENTISTS	4,826	4,957	5,172	5,528	5,911	5,960	5,564
OCEANOGRAPHERS	705	1,035	1,056	1,107	1,360	1,388	1,386
OTHER ENVIRONMENTAL SCIENTISTS 2/	-	-	-	-	-	-	579
MATHEMATICAL AND COMPUTER SCIENTISTS	20,794	22,157	22,404	23,134	23,874	24,349	26,049
COMPUTER SCIENTISTS 3/	-	3,667	3,705	4,135	4,581	4,782	6,131
MATHEMATICIANS 3/	-	18,490	18,699	18,999	19,293	19,567	19,918
LIFE SCIENTISTS	88,418	88,497	90,684	91,879	94,325	97,749	108,619
AGRICULTURAL SCIENTISTS	13,906	12,459	13,235	12,942	13,065	13,705	14,429
BIOLOGICAL SCIENTISTS	29,493	31,494	33,462	34,894	36,895	37,656	38,822
MEDICAL SCIENTISTS	45,019	44,544	43,987	44,043	44,365	46,388	50,784
OTHER LIFE SCIENTISTS 2/	-	-	-	-	-	-	4,584
PSYCHOLOGISTS	14,777	14,957	15,973	16,805	17,316	17,413	16,756
SOCIAL SCIENTISTS	36,193	36,620	38,246	40,755	41,060	41,826	41,295
ECONOMISTS	9,547	9,830	10,169	10,371	10,696	10,851	11,118
POLITICAL SCIENTISTS	8,187	8,396	8,687	9,073	9,010	9,055	8,839
SOCIOLOGISTS	9,686	10,048	10,744	11,428	11,671	11,505	10,877
OTHER SOCIAL SCIENTISTS	8,773	8,346	8,646	9,883	9,683	10,415	10,461

1/ IN 1979, DATA WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS.
2/ DATA NOT AVAILABLE PRIOR TO 1980.
3/ DATA NOT AVAILABLE PRIOR TO 1974.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-21. — FULL-TIME SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES BY FIELD OF EMPLOYMENT AND SEX: JANUARY 1974-78 AND 1980 1/

FIELD OF EMPLOYMENT	1974		1975		1976		1977		1978		1980	
	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN
TOTAL	186,283	32,124	189,723	33,613	194,306	35,517	199,363	36,829	203,136	38,927	211,299	44,360
ENGINEERS	22,425	339	22,211	369	22,487	450	23,609	504	24,071	596	25,818	707
AERONAUTICAL AND ASTRONAUTICAL ENGINEERS	1,001	22	919	25	936	30	946	22	946	18	1,117	27
CHEMICAL ENGINEERS	1,500	22	1,578	25	1,600	37	1,641	39	1,690	32	1,834	59
CIVIL ENGINEERS	3,698	61	3,771	61	3,934	83	4,026	89	4,114	128	4,217	115
ELECTRICAL ENGINEERS	5,347	57	5,336	57	5,335	74	5,395	71	5,505	91	6,286	112
MECHANICAL ENGINEERS	4,222	33	4,325	30	4,308	45	4,412	58	4,472	60	4,719	90
OTHER ENGINEERS	6,657	144	6,282	171	6,374	181	7,189	225	7,344	267	7,645	304
PHYSICAL SCIENTISTS	24,910	1,939	24,665	1,997	24,970	2,107	25,336	2,205	25,445	2,445	25,601	2,500
ASTRONOMERS 2/	-	-	-	-	-	-	-	-	-	-	758	68
CHEMISTS	12,690	1,385	12,395	1,428	12,632	1,514	12,906	1,564	13,010	1,725	12,608	1,784
PHYSICISTS	10,475	395	10,554	386	10,444	394	10,623	436	10,789	479	10,919	498
OTHER PHYSICAL SCIENTISTS	1,745	159	1,716	183	1,894	199	1,807	205	1,646	241	1,316	150
ENVIRONMENTAL SCIENTISTS	6,236	327	6,468	319	6,847	389	7,453	510	7,602	567	7,657	658
ATMOSPHERIC SCIENTISTS	532	39	525	34	568	33	654	38	786	35	743	43
EARTH SCIENTISTS	4,728	229	4,949	223	5,241	287	5,563	348	5,549	411	5,167	399
OCEANOGRAPHERS	976	59	994	62	1,038	69	1,236	124	1,267	121	1,262	125
OTHER ENVIRONMENTAL SCIENTISTS 2/	-	-	-	-	-	-	-	-	-	-	485	91
MATHEMATICAL AND COMPUTER SCIENTISTS	19,335	2,822	19,479	2,925	20,030	3,104	20,620	3,254	20,880	3,469	21,952	4,095
COMPUTER SCIENTISTS	3,282	385	3,259	446	3,653	482	4,045	536	4,223	559	5,224	907
MATHEMATICIANS	16,053	2,437	16,220	2,479	16,377	2,622	16,575	2,718	16,657	2,910	16,728	3,188
LIFE SCIENTISTS	70,756	17,741	72,639	18,045	73,583	18,296	75,605	18,720	77,791	19,958	84,392	24,227
AGRICULTURAL SCIENTISTS	11,235	1,224	11,685	1,550	11,777	1,165	11,957	1,108	12,469	1,236	13,104	1,325
BIOLOGICAL SCIENTISTS	25,823	5,671	27,143	6,319	27,864	7,030	29,320	7,575	29,864	7,792	30,601	8,239
MEDICAL SCIENTISTS	33,698	10,846	33,811	10,176	33,942	10,101	34,328	10,037	35,458	10,930	38,890	11,893
OTHER LIFE SCIENTISTS 2/	-	-	-	-	-	-	-	-	-	-	1,797	2,770
PSYCHOLOGISTS	11,769	3,188	12,391	3,582	12,816	3,989	13,062	4,254	13,098	4,315	12,430	4,326
SOCIAL SCIENTISTS	30,852	5,768	31,870	6,376	33,573	7,182	33,678	7,382	34,249	7,577	33,449	7,847
ECONOMISTS	9,042	788	9,304	865	9,436	935	9,741	955	9,884	967	10,008	1,110
POLITICAL SCIENTISTS	7,533	863	7,788	899	8,043	1,030	7,961	1,049	7,975	1,080	7,721	1,119
SOCIOLOGISTS	7,672	2,376	8,104	2,640	8,501	2,927	8,629	3,042	8,480	3,025	7,912	2,947
OTHER SOCIAL SCIENTISTS	6,605	1,741	6,674	1,972	7,593	2,290	7,347	2,336	7,910	2,505	7,808	2,671

1/ DATA WERE NOT COLLECTED IN 1973 AND 1979.
2/ DATA NOT AVAILABLE PRIOR TO 1980.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-22. — FULL-TIME SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES BY CONTROL AND LEVEL OF ATTAINMENT: JANUARY 1975-78 AND 1980 1/

CONTROL AND LEVEL OF ATTAINMENT	1975	1976	1977	1978	1980	AVERAGE ANNUAL PERCENT CHANGE 1978-80
ALL INSTITUTIONS						
TOTAL	223,336	229,823	236,192	242,063	255,659	2.8%
PH.D. OR SC.D.	122,760	126,478	131,056	135,601	140,477	1.8
ED.D. 1/	0	3,376	3,573	3,332	3,242	-1.4
M.D., D.D.S., ETC.	29,148	30,099	30,834	31,633	34,608	4.6
MASTER'S	54,719	53,717	54,076	54,531	56,811	2.1
BACHELOR'S	16,709	16,153	16,653	16,966	20,521	10.0
PUBLIC INSTITUTIONS						
TOTAL	156,819	161,755	166,424	169,289	177,947	2.5
PH.D. OR SC.D.	84,539	87,395	90,416	93,139	96,266	1.7
ED.D. 1/	0	2,690	2,908	2,739	2,683	-1.0
M.D., D.D.S., ETC.	15,525	16,248	16,562	16,425	17,409	3.0
MASTER'S	43,351	42,785	43,388	43,816	45,694	2.1
BACHELOR'S	13,404	12,637	13,150	13,170	15,895	9.9
PRIVATE INSTITUTIONS						
TOTAL	66,517	68,068	69,768	72,774	77,712	3.3
PH.D. OR SC.D.	38,221	39,083	40,640	42,462	44,211	2.0
ED.D. 1/	0	686	665	593	559	-2.9
M.D., D.D.S., ETC.	13,623	13,851	14,272	15,208	17,199	6.3
MASTER'S	11,368	10,932	10,688	10,715	11,117	1.9
BACHELOR'S	3,305	3,516	3,503	3,796	4,626	10.4

1/ IN 1979, DATA WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS.
2/ DATA NOT AVAILABLE PRIOR TO 1976.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-23. — U.S. SCIENTISTS AND ENGINEERS BY SEX: 1974-78

SEX	1974	1976	1978	PERCENT CHANGE	
				1974-76	1976-78
TOTAL, ALL U.S. SCIENTISTS AND ENGINEERS	2,481,800	2,705,800	2,741,400	9.0	1.3
MEN	2,265,000	2,455,800	2,475,300	8.4	.8
WOMEN	216,800	250,000	266,100	15.3	6.4
FULL-TIME SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES	218,407	229,767	242,063	5.2	5.4
MEN	186,283	194,273	203,136	4.3	4.6
WOMEN	32,124	35,484	38,927	10.5	9.7

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-24. — FULL-TIME SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES BY TYPE OF INSTITUTION, CONTROL, AND SEX: JANUARY 1980

TYPE OF INSTITUTION AND CONTROL	TOTAL	MEN		WOMEN	
		NUMBER	PERCENT OF TOTAL	NUMBER	PERCENT OF TOTAL
ALL INSTITUTIONS	255,659	211,299	82.6%	44,360	17.4%
PUBLIC	177,947	147,392	82.8	30,555	17.2
PRIVATE	77,712	63,907	82.2	13,805	17.8
INSTITUTIONS GRANTING:					
DOCTORATE IN S&E	180,433	150,246	83.3	30,187	16.7
PUBLIC	123,958	103,374	83.4	20,584	16.6
PRIVATE	56,475	46,872	83.0	9,603	17.0
MASTER'S IN S&E	27,953	23,467	84.0	4,486	16.0
PUBLIC	22,082	18,671	84.6	3,411	15.4
PRIVATE	5,871	4,796	81.7	1,075	18.3
BACHELOR'S IN S&E	20,788	17,030	81.9	3,758	18.1
PUBLIC	6,979	5,929	85.0	1,050	15.0
PRIVATE	13,809	11,101	80.4	2,708	19.6
OTHER DEGREES	702	634	90.3	68	9.7
PUBLIC	455	422	92.7	33	7.3
PRIVATE	247	212	85.8	35	14.2
2-YEAR INSTITUTIONS	25,783	19,922	77.3	5,861	22.7
PUBLIC	24,473	18,996	77.6	5,477	22.4
PRIVATE	1,310	926	70.7	384	29.3

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-25. — PART-TIME SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES BY TYPE OF INSTITUTION, CONTROL, AND SEX: JANUARY 1980

TYPE OF INSTITUTION AND CONTROL	NUMBER	MEN		WOMEN	
		TOTAL	PERCENT OF TOTAL	NUMBER	PERCENT OF TOTAL
ALL INSTITUTIONS	69,184	51,859	75.0%	17,325	25.0%
PUBLIC	45,752	33,806	73.9	11,946	26.1
PRIVATE	23,432	18,053	77.0	5,379	23.0
INSTITUTIONS GRANTING:					
DOCTORATE IN S&E	38,078	29,329	77.0	8,749	23.0
PUBLIC	23,678	17,673	74.6	6,005	25.4
PRIVATE	14,400	11,656	80.9	2,744	19.1
MASTER'S IN S&E	9,483	6,816	71.9	2,667	28.1
PUBLIC	6,216	4,460	71.8	1,756	28.2
PRIVATE	3,267	2,356	72.1	911	27.9
BACHELOR'S IN S&E	6,166	4,387	71.1	1,779	28.9
PUBLIC	1,377	997	72.4	380	27.6
PRIVATE	4,789	3,390	70.8	1,399	29.2
OTHER DEGREES	162	140	86.4	22	13.6
PUBLIC	53	50	94.3	3	5.7
PRIVATE	109	90	82.6	19	17.4
2-YEAR INSTITUTIONS	15,295	11,187	73.1	4,108	26.9
PUBLIC	14,428	10,626	73.6	3,802	26.4
PRIVATE	867	561	64.7	306	35.3

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-26. — UNEMPLOYMENT RATE OF U.S. SCIENTISTS AND ENGINEERS BY SEX: 1974, 1976, AND 1978

YEAR AND SEX	LABOR FORCE	EMPLOYED SCIENTISTS AND ENGINEERS	UNEMPLOYED, SEEKING EMPLOYMENT	UNEMPLOYMENT RATE
1974, TOTAL	2,288,000	2,248,200	39,800	1.7
MEN	2,104,700	2,072,100	32,600	1.5
WOMEN	183,300	176,100	7,200	3.9
1976, TOTAL	2,451,700	2,337,200	74,600	3.0
MEN	2,240,000	2,179,900	60,100	2.7
WOMEN	211,700	197,200	14,500	6.8
1978, TOTAL	2,507,600	2,473,200	34,400	1.4
MEN	2,270,400	2,241,700	28,700	1.3
WOMEN	237,200	231,500	5,700	2.4

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-27. — DOCTORAL SCIENTISTS AND ENGINEERS IN THE UNITED STATES BY RACE: 1973 AND 1979

RACE	1973		1979	
	NUMBER	PERCENT DISTRIBUTION	NUMBER	PERCENT DISTRIBUTION
TOTAL	238,913	100.0	332,280	100.0
WHITE	217,112	90.9	293,491	88.3
MINORITIES, TOTAL	12,296	5.1	26,365	7.9
BLACK	2,242	0.9	3,707	1.1
AMERICAN INDIAN	435	0.2	964	0.3
ASIAN	9,619	4.0	21,694	6.5
NO REPORT	9,505	4.0	12,424	3.7

SOURCE: NATIONAL SCIENCE FOUNDATION, SURVEY OF DOCTORATE RECIPIENTS

TABLE B-28. — DOCTORAL SCIENTISTS AND ENGINEERS EMPLOYED IN ACADEMIC INSTITUTIONS BY SCIENCE/ENGINEERING FIELD AND RACE: 1973 AND 1979

FIELD	1973				1979				PERCENT CHANGE, 1973-79			
	WHITE	BLACK	AMERICAN INDIAN	ASIAN / PACIFIC ISLANDER	WHITE	BLACK	AMERICAN INDIAN	ASIAN / PACIFIC ISLANDER	WHITE	BLACK	AMERICAN INDIAN	ASIAN / PACIFIC ISLANDER
TOTAL	115,922	1,381	274	5,155	152,309	2,118	618	9,826	31.4	53.4	125.5	90.6
ENGINEERS	11,467	66	26	1,001	14,686	89	15	1,642	28.1	34.8	-42.3	64.0
PHYSICAL SCIENTISTS	19,283	271	34	1,093	23,724	235	120	1,799	23.0	-13.3	252.9	64.6
ENVIRONMENTAL SCIENTISTS	4,830	6	13	120	5,750	4	11	191	19.0	-33.3	-15.4	59.2
MATHEMATICAL AND COMPUTER SCIENTISTS	10,575	115	10	494	12,936	133	52	941	22.3	15.7	420.0	90.5
LIFE SCIENTISTS	35,658	455	74	1,541	46,199	646	168	3,334	29.6	42.0	127.0	116.4
PSYCHOLOGISTS	13,263	171	43	115	16,981	331	136	229	28.0	93.6	216.3	99.1
SOCIAL SCIENTISTS	20,846	297	74	791	32,033	680	116	1,690	53.7	129.0	56.8	113.7

SOURCE: NATIONAL SCIENCE FOUNDATION, SURVEY OF DOCTORATE RECIPIENTS

TABLE B-29. — UNEMPLOYMENT RATE OF U.S. SCIENTISTS AND ENGINEERS BY RACE: 1974, 1976, AND 1978

YEAR AND RACE	LABOR FORCE	EMPLOYED SCIENTISTS AND ENGINEERS	UNEMPLOYED, SEEKING EMPLOYMENT	UNEMPLOYMENT RATE
1974, TOTAL	2,288,000	2,248,200	39,800	1.7
WHITE	2,188,500	2,152,900	35,600	1.6
BLACK	35,500	32,500	3,000	8.5
ASIAN	41,200	40,500	700	1.7
OTHER	22,800	22,500	300	1.3
1976, TOTAL	2,451,700	2,377,200	74,600	3.0
WHITE	2,348,200	2,278,800	69,400	3.0
BLACK	36,000	33,000	3,000	8.3
ASIAN	42,600	41,400	1,200	2.8
OTHER	24,800	23,800	1,000	4.0
1978, TOTAL	2,507,600	2,473,200	34,400	1.4
WHITE	2,393,600	2,360,900	32,700	1.4
BLACK	39,600	39,000	600	1.5
ASIAN	51,300	50,500	800	1.6
OTHER	23,200	22,800	400	1.7

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-30. — SCIENTISTS AND ENGINEERS EMPLOYED AT UNIVERSITIES AND COLLEGES BY TYPE: JANUARY 1975–78 AND 1980 1/

TYPE OF ACADEMIC EMPLOYMENT	1975	1976	1977	1978	1980
TOTAL	278,919	288,221	297,768	307,642	324,843
POSTDOCTORATES 2/	16,660	17,034	18,653	19,753	18,589
ALL OTHER ACADEMIC SCIENTISTS AND ENGINEERS	262,259	271,187	279,115	287,889	306,254

1/ DATA ON POSTDOCTORATES WERE NOT COLLECTED IN FALL 1978.
2/ AT DOCTORATE-GRANTING INSTITUTIONS ONLY; DATA ARE FOR FALL SEMESTER OF PRECEDING YEAR.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-31. — POSTDOCTORATES, GRADUATE RESEARCH ASSISTANTS, AND R&D EXPENDITURES IN DOCTORATE-GRANTING INSTITUTIONS BY SCIENCE/ENGINEERING FIELD: FISCAL YEAR 1979

(DOLLARS IN MILLIONS)

FIELD	POSTDOCTORATES		GRADUATE RESEARCH ASSISTANTS		R&D EXPENDITURES	
	NUMBER	PERCENT DISTRIBUTION	NUMBER	PERCENT DISTRIBUTION	AMOUNT	PERCENT DISTRIBUTION
TOTAL	18,589	100.0	48,497	100.0	$ 5,093	100.0
ENGINEERING	1,073	5.8	12,684	26.2	708	13.9
PHYSICAL SCIENCES	4,028	21.7	7,740	16.0	543	10.7
ENVIRONMENTAL SCIENCES	329	1.8	3,452	7.1	420	8.2
MATHEMATICAL AND COMPUTER SCIENCES	203	1.1	1,626	3.4	141	2.8
LIFE SCIENCES	12,089	65.0	15,129	31.2	2,785	54.7
PSYCHOLOGY	456	2.5	2,333	4.8	93	1.8
SOCIAL SCIENCES	411	2.2	5,533	11.4	278	5.5
OTHER SCIENCES, N.E.C.	–	–	–	–	125	2.5

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-32. — POSTDOCTORATES, GRADUATE RESEARCH ASSISTANTS, AND R&D EXPENDITURES IN DOCTORATE-GRANTING INSTITUTIONS BY SOURCE OF SUPPORT: FALL 1974-77 AND 1979

(DOLLARS IN MILLIONS)

SOURCE OF SUPPORT	FALL				
	1974	1975	1976	1977	1979
POSTDOCTORATES, TOTAL 1/	16,660	17,034	18,653	19,753	18,589
FEDERALLY SUPPORTED	11,797	12,019	13,166	13,454	13,823
NONFEDERALLY SUPPORTED	4,863	5,015	5,487	6,299	4,766
GRADUATE RESEARCH ASSISTANTS, TOTAL 1/	39,611	40,147	42,728	43,914	48,497
FEDERALLY SUPPORTED	22,317	23,086	24,427	25,193	27,829
NONFEDERALLY SUPPORTED	17,294	17,061	18,301	18,721	20,668
	FISCAL YEAR				
	1974	1975	1976	1977	1979
R&D EXPENDITURES (CONSTANT DOLLARS), TOTAL 1/	$ 2,635	$ 2,709	$ 2,775	$ 2,834	$ 3,128
FEDERAL SOURCES	1,774	1,817	1,871	1,906	2,070
NONFEDERAL SOURCES	861	891	903	927	1,058

1/ DATA WERE NOT COLLECTED IN FALL 1978.
2/ BASED ON GNP IMPLICIT PRICE DEFLATOR EXPRESSED IN 1972 DOLLARS.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-33. — POSTDOCTORATES IN DOCTORATE-GRANTING INSTITUTIONS BY SCIENCE/ENGINEERING FIELD, INSTITUTIONAL CONTROL, AND CITIZENSHIP: FALL 1979

FIELD	NUMBER	PERCENT DISTRIBUTION	CONTROL				CITIZENSHIP			
			PUBLIC		PRIVATE		FOREIGN		U.S.	
			NUMBER	PERCENT DISTRIBUTION	NUMBER	PERCENT DISTRIBUTION	NUMBER	PERCENT DISTRIBUTION	NUMBER	PERCENT DISTRIBUTION
TOTAL	18,589	100.0	10,268	100.0	8,321	100.0	6,075	100.0	12,514	100.0
ENGINEERING	1,073	5.8	546	5.3	527	6.3	663	10.9	410	3.3
PHYSICAL SCIENCES	4,028	21.7	2,405	23.4	1,623	19.5	1,992	32.8	2,036	16.3
ENVIRONMENTAL SCIENCES	329	1.8	205	2.0	124	1.5	112	1.8	217	1.7
MATHEMATICAL AND COMPUTER SCIENCES	203	1.1	95	0.9	108	1.3	94	1.5	109	0.9
LIFE SCIENCES	12,039	65.0	6,575	64.0	5,514	66.3	3,079	50.7	9,010	72.0
PSYCHOLOGY	456	2.5	208	2.0	248	3.0	34	0.6	422	3.4
SOCIAL SCIENCES	411	2.2	234	2.3	177	2.1	101	1.7	310	2.5

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-34. — POSTDOCTORATES AND OTHER NONFACULTY DOCTORAL RESEARCH STAFF IN ALL GRADUATE INSTITUTIONS BY SCIENCE/ENGINEERING FIELD AND SEX: FALL 1979

FIELD	POSTDOCTORATES			OTHER NON-FACULTY DOCTORAL RESEARCH STAFF		
	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN
TOTAL	18,639	15,250	3,389	2,697	2,080	617
ENGINEERING	1,073	1,024	49	265	253	12
PHYSICAL SCIENCES	4,059	3,673	386	469	414	55
ENVIRONMENTAL SCIENCES	329	293	36	105	98	7
MATHEMATICAL/COMPUTER SCIENCES	203	181	22	108	97	11
LIFE SCIENCES	12,105	9,513	2,592	1,506	1,054	452
PSYCHOLOGY	456	298	158	63	30	33
SOCIAL SCIENCES	414	268	146	181	134	47

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-35. — TOTAL GRADUATE ENROLLMENT IN INSTITUTIONS OF HIGHER EDUCATION BY FIELD: 1974-79

FIELD	1974	1975	1976	1977	1978	1979
TOTAL, ALL GRADUATE STUDENTS 1/	1,194,090	1,267,537	1,089,290	1,090,463	1,083,413	1,074,922
SCIENCE AND ENGINEERING 2/	267,012	295,608	300,387	309,580	310,380	321,770
ALL OTHER FIELDS	927,078	971,929	788,903	780,883	773,033	753,152

1/ AT ALL GRADUATE INSTITUTIONS, AS REPORTED BY NATIONAL CENTER FOR EDUCATION STATISTICS, DEPARTMENT OF EDUCATION, SURVEY OF OPENING FALL ENROLLMENT IN HIGHER EDUCATION, ANNUAL SERIES.
2/ AT DOCTORATE-GRANTING INSTITUTIONS ONLY, AS REPORTED BY NATIONAL SCIENCE FOUNDATION, SURVEY OF GRADUATE SCIENCE STUDENTS AND POSTDOCTORATES, ANNUAL SERIES.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-36. — SCIENCE/ENGINEERING GRADUATE STUDENTS AND SCIENTISTS AND ENGINEERS BY TYPE OF GRADUATE INSTITUTION: 1974-80

YEAR	TOTAL, ALL GRADUATE INSTITUTIONS	DOCTORATE-GRANTING	MASTER'S-GRANTING
GRADUATE STUDENTS, FALL SEMESTER:			
1974	1/	267,012	1/
1975	337,913	295,608	42,305
1976	344,641	300,387	44,254
1977	358,683	309,580	49,103
1978	1/	310,380	1/
1979	375,267	321,770	53,497
SCIENTISTS AND ENGINEERS, JANUARY:			
1975	214,076	180,001	34,075
1976	219,045	185,902	33,143
1977	227,594	192,804	34,790
1978	238,682	199,920	38,762
1979	1/	210,441	1/
1980	255,947	218,511	37,436

1/ DATA ON GRADUATE STUDENTS WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS IN 1974 AND 1978; DATA ON SCIENTISTS AND ENGINEERS WERE COLLECTED ONLY FROM DOCTORATE-GRANTING INSTITUTIONS IN 1979.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-37. — NUMBER OF DEGREES GRANTED BY INSTITUTIONS OF HIGHER EDUCATION BY LEVEL AND FIELD: 1974-79

LEVEL AND FIELD	ACADEMIC YEAR					
	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79
BACHELOR'S AND FIRST PROFESSIONAL DEGREES, TOTAL	1,008,654	987,922	997,504	993,008	997,165	1,000,562
SCIENCE AND ENGINEERING	305,062	294,920	292,174	288,543	288,167	288,625
HEALTH FIELDS	61,025	70,058	79,126	82,378	86,012	89,951
ALL OTHER FIELDS	642,567	622,944	626,204	622,087	622,986	621,986
MASTER'S DEGREES, TOTAL	278,259	293,651	313,001	318,241	312,816	302,075
SCIENCE AND ENGINEERING	54,175	53,852	54,747	56,731	56,237	54,456
HEALTH FIELDS	9,741	10,842	12,696	13,092	14,483	15,637
ALL OTHER FIELDS	214,343	228,957	245,558	248,418	242,096	231,982
DOCTOR'S DEGREES, TOTAL	33,826	34,086	34,076	33,244	32,156	32,756
SCIENCE AND ENGINEERING	17,865	17,784	17,288	16,937	16,196	16,363
HEALTH FIELDS	578	618	577	538	654	718
ALL OTHER FIELDS	15,383	15,684	16,211	15,769	15,306	15,675

SOURCE: NATIONAL CENTER FOR EDUCATION STATISTICS, DEPARTMENT OF EDUCATION

TABLE B-38. — GRADUATE STUDENTS IN DOCTORATE-GRANTING INSTITUTIONS BY STATUS AND SCIENCE/ENGINEERING FIELD: FALL 1974-79

STATUS AND FIELD	1974	1975	1976	1977	1978	1979
FULL TIME, TOTAL	195,906	210,822	214,729	218,445	216,849	224,057
ENGINEERING	33,717	37,138	36,437	36,781	37,026	39,282
PHYSICAL SCIENCES	21,416	21,443	21,787	21,933	21,657	21,922
ENVIRONMENTAL SCIENCES	8,201	8,672	9,298	9,593	9,695	9,919
MATHEMATICAL/ COMPUTER SCIENCES	13,409	13,839	14,289	13,782	13,461	13,959
LIFE SCIENCES	54,650	59,236	61,649	64,138	64,847	66,536
PSYCHOLOGY	18,906	19,775	21,546	21,413	20,620	20,705
SOCIAL SCIENCES	45,607	50,719	49,723	50,805	49,543	51,734
PART TIME, TOTAL	71,106	84,786	85,658	91,135	93,531	97,713
ENGINEERING	23,433	27,991	28,212	29,398	28,543	29,355
PHYSICAL SCIENCES	3,325	3,342	3,467	3,356	3,380	3,335
ENVIRONMENTAL SCIENCES	1,748	2,000	2,042	2,244	2,138	2,324
MATHEMATICAL/ COMPUTER SCIENCES	6,866	7,263	7,308	7,243	7,671	8,473
LIFE SCIENCES	11,856	13,837	15,123	18,964	20,125	20,507
PSYCHOLOGY	6,123	7,369	6,799	7,038	7,243	7,267
SOCIAL SCIENCES	17,755	22,984	22,707	22,892	24,431	26,452

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-39. — FULL-TIME SCIENCE/ENGINEERING GRADUATE STUDENTS IN DOCTORATE-GRANTING INSTITUTIONS BY LEVEL OF STUDY: FALL 1974-79

YEAR	TOTAL	FIRST YEAR	BEYOND FIRST YEAR
1974	195,906	73,745	122,161
1975	210,822	79,459	131,363
1976	214,729	78,458	136,271
1977	218,445	80,713	137,732
1978	216,849	74,456	142,393
1979	224,057	73,263	150,794

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-40. — FULL-TIME SCIENCE/ENGINEERING GRADUATE STUDENTS IN DOCTORATE-GRANTING INSTITUTIONS BY SOURCE OF MAJOR SUPPORT: FALL 1974-79

SOURCE OF MAJOR SUPPORT	1974	1975	1976	1977	1978	1979
TOTAL	195,906	210,822	214,729	218,445	216,849	224,057
FEDERAL SUPPORT	48,007	48,289	48,614	50,501	51,302	52,978
INSTITUTIONAL SUPPORT 1/	75,396	77,286	79,508	80,860	79,902	83,048
OTHER OUTSIDE SUPPORT	16,380	16,857	17,688	18,258	19,265	20,128
SELF-SUPPORT	56,123	68,390	68,919	68,826	66,380	67,903

1/ INCLUDES SUPPORT FROM STATE AND LOCAL GOVERNMENTS.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-41. — FEDERAL OBLIGATIONS TO UNIVERSITIES AND COLLEGES FOR FELLOWSHIPS TRAINEESHIPS, AND TRAINING GRANTS BY SCIENCE/ENGINEERING FIELD: FY 1973-79

(DOLLARS IN THOUSANDS)

FIELD	1973	1974	1975	1976	1977	1978	1979
TOTAL	$ 287,210	$ 326,600	$ 201,273	$ 174,871	$ 184,671	$ 205,865	$ 204,805
ENGINEERING	12,631	10,361	10,821	8,100	10,015	12,626	13,682
PHYSICAL SCIENCES	3,901	4,051	3,238	3,049	3,675	1,441	5,473
ENVIRONMENTAL SCIENCES	4,124	4,927	3,285	1,629	764	663	1,507
MATHEMATICAL/COMPUTER SCIENCES	3,189	3,975	2,389	1,956	1,875	558	1,558
LIFE SCIENCES	179,222	225,575	135,600	105,631	118,799	130,840	136,009
PSYCHOLOGY	20,513	27,209	12,819	9,541	17,274	16,937	15,296
SOCIAL SCIENCES	43,515	40,741	30,243	39,743	21,755	20,311	18,198
OTHER SCIENCES, N.E.C.	20,115	9,761	2,878	5,222	10,514	22,469	13,082

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-42. — FULL-TIME SCIENCE/ENGINEERING GRADUATE STUDENTS IN DOCTORATE-GRANTING INSTITUTIONS BY TYPE OF MAJOR SUPPORT: FALL 1974-77 AND 1979 1/

TYPE OF MAJOR SUPPORT	1974	1975	1976	1977	1979
TOTAL	195,906	210,822	214,729	218,445	224,057
FELLOWSHIPS AND TRAINEESHIPS	38,499	38,814	37,489	39,208	39,073
RESEARCH ASSISTANTSHIPS	39,611	40,147	42,728	43,914	48,497
TEACHING ASSISTANTSHIPS	46,201	47,364	48,327	48,692	49,777
OTHER TYPES OF SUPPORT	71,595	84,497	86,185	86,631	86,710

1/ DATA WERE NOT COLLECTED IN FALL 1978.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-43. -- FULL-TIME GRADUATE STUDENTS IN DOCTORATE-GRANTING INSTITUTIONS BY SEX AND SCIENCE/ENGINEERING FIELD: FALL 1974-77 AND 1979 1/

SEX AND FIELD	1974	1975	1976	1977	1979
TOTAL	195,906	210,822	214,729	218,445	224,057
MEN, TOTAL	149,576	158,557	156,853	155,233	152,772
ENGINEERING	32,350	35,257	34,404	34,454	35,947
PHYSICAL SCIENCES	18,837	18,742	18,853	18,873	18,600
ENVIRONMENTAL SCIENCES	7,231	7,515	7,802	7,981	7,854
MATHEMATICAL/COMPUTER SCIENCES	10,897	11,128	11,406	10,987	11,063
LIFE SCIENCES	37,513	39,862	39,491	39,285	37,727
PSYCHOLOGY	11,531	11,488	12,361	11,823	10,579
SOCIAL SCIENCES	31,217	34,565	32,536	31,830	31,002
WOMEN, TOTAL	46,330	52,265	57,876	63,212	71,285
ENGINEERING	1,367	1,881	2,033	2,327	3,335
PHYSICAL SCIENCES	2,579	2,701	2,934	3,060	3,322
ENVIRONMENTAL SCIENCES	970	1,157	1,496	1,612	2,065
MATHEMATICAL/COMPUTER SCIENCES	2,512	2,711	2,883	2,795	2,896
LIFE SCIENCES	17,137	19,374	22,158	24,853	28,809
PSYCHOLOGY	7,375	8,287	9,185	9,590	10,126
SOCIAL SCIENCES	14,390	16,154	17,187	18,975	20,732

1/ DATA WERE NOT COLLECTED IN FALL 1978.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-44. — SCIENCE/ENGINEERING DOCTORATE RECIPIENTS BY SEX AND SCIENCE/ENGINEERING FIELD: JUNE 1974-79

SEX AND FIELD	1974	1975	1976	1977	1978	1979
TOTAL	19,086	19,048	18,790	18,281	17,956	18,247
MEN, TOTAL	16,382	16,047	15,628	14,989	14,430	14,393
ENGINEERING	3,110	2,909	2,738	2,567	2,370	2,431
PHYSICAL SCIENCES	2,895	2,793	2,615	2,475	2,363	2,382
ENVIRONMENTAL SCIENCES	637	658	643	632	562	588
MATHEMATICAL/ COMPUTER SCIENCES	1,081	1,039	890	831	828	832
LIFE SCIENCES	3,935	3,940	3,892	3,810	3,805	3,886
PSYCHOLOGY	1,796	1,876	1,932	1,879	1,926	1,824
SOCIAL SCIENCES	2,928	2,832	2,918	2,795	2,576	2,450
WOMEN, TOTAL	2,704	3,001	3,162	3,292	3,526	3,854
ENGINEERING	34	50	53	74	53	63
PHYSICAL SCIENCES	231	262	243	244	248	293
ENVIRONMENTAL SCIENCES	37	36	71	59	61	58
MATHEMATICAL/ COMPUTER SCIENCES	115	110	113	128	131	145
LIFE SCIENCES	855	944	949	957	1,082	1,190
PSYCHOLOGY	791	873	946	1,081	1,123	1,257
SOCIAL SCIENCES	641	726	787	749	828	848

SOURCE: NATIONAL RESEARCH COUNCIL, SURVEY OF EARNED DOCTORATES

TABLE B-45. — WOMEN IN SCIENCE AND ENGINEERING BY FIELD: 1978 AND 1979

FIELD	EMPLOYED LABOR FORCE, 1978		DOCTORATE RECIPIENTS, JUNE 1979		FULL-TIME GRADUATE ENROLLMENT, FALL 1979 1/	
	NUMBER	PERCENT DISTRI-BUTION	NUMBER	PERCENT DISTRI-BUTION	NUMBER	PERCENT DISTRI-BUTION
TOTAL	266,100	100.0	3,854	100.0	71,285	100.0
ENGINEERING	21,700	8.2	63	1.6	3,335	4.7
PHYSICAL SCIENCES	22,800	8.6	293	7.6	3,322	4.7
ENVIRONMENTAL SCIENCES	8,600	3.2	58	1.5	2,065	2.9
MATHEMATICAL/COMPUTER SCIENCES	62,500	23.5	145	3.8	2,896	4.1
LIFE SCIENCES	72,200	27.1	1,190	30.9	28,809	40.4
PSYCHOLOGY	36,000	13.5	1,257	32.6	10,126	14.2
SOCIAL SCIENCES	42,200	15.9	848	22.0	20,732	29.1

1/ AT DOCTORATE-GRANTING INSTITUTIONS ONLY.
SOURCE: NATIONAL SCIENCE FOUNDATION AND NATIONAL RESEARCH COUNCIL, SURVEY OF DOCTORATE RECIPIENTS.

TABLE B-46. — FULL-TIME GRADUATE STUDENTS IN DOCTORATE-GRANTING INSTITUTIONS BY SEX, SOURCE OF MAJOR SUPPORT, AND AREA OF SCIENCE: 1979

SEX AND SOURCE OF MAJOR SUPPORT	TOTAL	ENGINEERING	PHYSICAL SCIENCES	ENVIRONMENTAL SCIENCES	MATHEMATICAL SCIENCES	LIFE SCIENCES	PSYCHOLOGY	SOCIAL SCIENCES
TOTAL:								
TOTAL, ALL SOURCES	224,057	39,282	21,922	9,919	13,95[illegible]	66,536	20,705	51,734
FEDERAL, TOTAL	52,978	11,006	7,447	3,414	1,432	20,665	3,448	5,566
DEPT OF DEFENSE	4,998	2,770	672	392	426	299	150	289
DEPT OF HEW, TOTAL	22,714	1,096	1,568	254	144	14,806	2,492	2,354
NIH	11,959	504	1,399	44	101	8,251	1,117	543
OTHER HEW	10,755	592	169	210	43	6,555	1,375	1,811
NSF	9,272	2,411	2,949	1,276	575	1,275	254	532
ALL OTHER FEDERAL	15,994	4,729	2,258	1,492	287	4,285	552	2,391
INSTITUTIONAL SUPPORT	83,048	11,362	11,543	3,472	7,924	22,342	7,439	18,966
OTHER OUTSIDE SUPPORT, TOTAL	20,128	5,771	1,461	835	997	5,915	1,351	3,798
ALL OTHER U.S.	12,569	3,798	1,066	511	583	3,359	1,238	2,014
FOREIGN	7,559	1,973	395	324	414	2,556	113	1,784
SELF-SUPPORT	67,903	11,143	1,471	2,198	3,606	17,614	8,467	23,404
MEN:								
TOTAL, ALL SOURCES	152,772	35,947	18,600	7,854	11,063	37,727	10,579	31,002
FEDERAL, TOTAL	36,523	10,203	6,512	2,763	1,236	10,842	1,803	3,164
DEPT OF DEFENSE	4,586	2,677	604	350	382	210	106	257
DEPT OF HEW, TOTAL	11,386	928	1,251	176	107	6,742	1,221	961
NIH	7,636	437	1,127	31	82	5,211	531	217
OTHER HEW	3,750	491	124	145	25	1,531	690	744
NSF	7,771	2,250	2,630	1,034	502	870	141	344
ALL OTHER FEDERAL	12,780	4,348	2,027	1,203	245	3,020	335	1,602
INSTITUTIONAL SUPPORT	58,402	10,296	9,606	2,649	6,184	14,169	3,879	11,619
OTHER OUTSIDE SUPPORT, TOTAL	15,768	5,333	1,250	703	797	4,240	724	2,721
ALL OTHER U.S.	9,230	3,448	904	402	452	2,157	656	1,211
FOREIGN	6,538	1,885	346	301	345	2,083	68	1,510
SELF-SUPPORT	42,079	10,115	1,232	1,739	2,846	8,476	4,173	13,498
WOMEN:								
TOTAL, ALL SOURCES	71,285	3,335	3,322	2,065	2,896	28,809	10,126	20,732
FEDERAL, TOTAL	16,455	803	935	651	196	9,823	1,645	2,402
DEPT OF DEFENSE	412	93	68	42	44	89	44	32
DEPT OF HEW, TOTAL	11,328	168	317	78	37	8,064	1,271	1,393
NIH	4,323	67	272	13	19	3,040	586	326
OTHER HEW	7,005	101	45	65	18	5,024	685	1,067
NSF	1,501	161	319	242	73	405	113	188
ALL OTHER FEDERAL	3,214	381	231	289	42	1,265	217	789
INSTITUTIONAL SUPPORT	24,646	1,066	1,937	823	1,740	8,173	3,560	7,347
OTHER OUTSIDE SUPPORT, TOTAL	4,360	438	211	132	200	1,675	627	1,077
ALL OTHER U.S.	3,339	350	162	109	131	1,202	582	803
FOREIGN	1,021	88	49	23	69	473	45	274
SELF-SUPPORT	25,824	1,028	239	459	760	9,138	4,294	9,906

SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-47. — FULL-TIME SCIENCE/ENGINEERING GRADUATE STUDENTS IN DOCTORATE-GRANTING INSTITUTIONS BY CITIZENSHIP AND SCIENCE/ENGINEERING FIELD: FALL 1974-77 AND 1979 1/

CITIZENSHIP AND FIELD	1974	1975	1976	1977	1979
TOTAL	195,906	210,822	214,729	218,445	224,057
U.S. CITIZENS, TOTAL	164,212	177,694	180,327	181,584	179,262
ENGINEERING	22,713	25,284	24,139	23,471	23,103
PHYSICAL SCIENCES	16,938	17,047	17,344	17,344	16,735
ENVIRONMENTAL SCIENCES	7,334	7,759	8,324	8,486	8,639
MATHEMATICAL/COMPUTER SCIENCES	10,889	11,118	11,236	10,519	9,706
LIFE SCIENCES	48,155	52,771	54,947	57,245	58,383
PSYCHOLOGY	18,370	19,208	20,980	20,802	19,744
SOCIAL SCIENCES	39,813	44,507	43,357	43,717	42,952
FOREIGN, TOTAL	31,694	33,128	34,402	36,861	44,795
ENGINEERING	11,004	11,854	12,298	13,310	16,179
PHYSICAL SCIENCES	4,478	4,396	4,443	4,589	5,187
ENVIRONMENTAL SCIENCES	867	913	974	1,107	1,280
MATHEMATICAL/COMPUTER SCIENCES	2,520	2,721	3,053	3,263	4,253
LIFE SCIENCES	6,495	6,465	6,702	6,893	8,153
PSYCHOLOGY	536	567	566	611	961
SOCIAL SCIENCES	5,794	6,212	6,366	7,088	8,782

1/ DATA WERE NOT COLLECTED IN FALL 1978.
SOURCE: NATIONAL SCIENCE FOUNDATION

TABLE B-48. — TOTAL ENROLLMENT AT INSTITUTIONS OF HIGHER EDUCATION BY STATUS: FALL 1979

STATUS	FALL 1979	
	NUMBER	PERCENT DISTRIBUTION
TOTAL ENROLLMENT, ALL FIELDS	11,707,126	100.0
FULL TIME	6,901,426	59.0
PART TIME	4,805,700	41.0
GRADUATE ENROLLMENT, ALL FIELDS	1,074,922	100.0
FULL TIME	436,458	40.6
PART TIME	638,464	59.4
GRADUATE ENROLLMENT, SCIENCE/ENGINEERING FIELDS 1/	321,770	100.0
FULL TIME	224,057	69.6
PART TIME	97,713	30.4

1/ AT DOCTORATE-GRANTING INSTITUTIONS ONLY.
SOURCE: NATIONAL CENTER FOR EDUCATION STATISTICS, DEPARTMENT OF EDUCATION, AND NATIONAL SCIENCE FOUNDATION

TABLE B-49. — GRADUATE ENROLLMENT BY STATUS: FALL 1974-77 AND 1979 1/

STATUS	FALL				
	1974	1975	1976	1977	1979
GRADUATE ENROLLMENT, ALL FIELDS	1,194,090	1,267,537	1,089,290	1,090,463	1,074,922
FULL TIME	428,984	454,599	432,960	437,732	436,458
PART TIME	765,106	812,938	656,330	652,731	638,464
GRADUATE ENROLLMENT, SCIENCE AND ENGINEERING FIELDS 2/	267,012	295,608	300,387	309,580	321,770
FULL TIME	195,906	210,822	214,729	218,445	224,057
PART TIME	71,106	84,786	85,658	91,135	97,713

1/ DATA WERE NOT COLLECTED IN FALL 1978.
2/ AT DOCTORATE-GRANTING INSTITUTIONS.
SOURCE: NATIONAL CENTER FOR EDUCATION STATISTICS, DEPARTMENT OF EDUCATION, AND NATIONAL SCIENCE FOUNDATION

TABLE B-50. — PART-TIME GRADUATE STUDENTS IN DOCTORATE-GRANTING INSTITUTIONS BY SCIENCE/ENGINEERING FIELD, LEVEL OF STUDY, SEX, AND TYPE OF CONTROL: 1979

FIELD	TOTAL	LEVEL OF STUDY		SEX		TYPE OF CONTROL	
		FIRST YEAR	BEYOND FIRST YEAR	MEN	WOMEN	PUBLIC	PRIVATE
TOTAL, ALL FIELDS	97,713	30,577	67,136	64,888	32,825	56,966	40,747
ENGINEERING	29,355	9,523	19,832	27,181	2,174	13,631	15,724
AERONAUTICAL	314	139	175	301	13	255	59
AGRICULTURAL	114	21	93	109	5	114	0
BIOMEDICAL	164	28	136	153	11	70	94
CHEMICAL	1,298	377	921	1,126	172	802	496
CIVIL	4,381	1,225	3,156	4,075	306	2,575	1,806
ELECTRICAL	8,301	2,750	5,551	7,858	443	3,974	4,327
ENGINEERING SCIENCE	611	156	455	561	50	592	19
INDUSTRIAL	7,410	3,004	4,406	6,637	773	1,484	5,926
MECHANICAL	3,180	921	2,259	3,001	179	1,755	1,425
METALLURGICAL/MATERIALS	555	141	414	491	64	279	276
MINING	112	17	95	110	2	107	5
NUCLEAR	257	36	221	246	11	183	74
PETROLEUM	105	8	97	101	4	78	27
ENGINEERING, N.E.C.	2,553	700	1,853	2,412	141	1,363	1,190
PHYSICAL SCIENCES	3,335	963	2,372	2,623	712	2,043	1,292
ASTRONOMY	38	7	31	31	7	36	2
CHEMISTRY	2,052	628	1,424	1,502	550	1,253	799
PHYSICS	1,052	285	767	947	105	721	331
PHYSICAL SCIENCES, N.E.C.	193	43	150	143	50	33	160
ENVIRONMENTAL SCIENCES	2,324	443	1,881	1,817	507	1,903	421
ATMOSPHERIC SCIENCES	101	17	84	91	10	100	1
GEOSCIENCES	1,415	271	1,144	1,098	317	1,142	273
OCEANOGRAPHY	360	55	305	301	59	308	52
ENVIRONMENTAL SCIENCES, N.E.C.	448	100	348	327	121	353	95
MATHEMATICAL/COMPUTER SCIENCES	8,473	2,883	5,590	6,214	2,259	4,841	3,632
COMPUTER SCIENCE	4,398	1,313	3,085	3,444	954	2,490	1,908
MATHEMATICS AND APPLIED MATHEMATICS	3,733	1,513	2,220	2,545	1,188	2,087	1,646
STATISTICS	342	57	285	225	117	264	78
LIFE SCIENCES	20,507	6,583	13,924	8,141	12,366	14,431	6,076
AGRICULTURAL SCIENCES	2,158	384	1,774	1,703	455	2,142	16
BIOLOGICAL SCIENCES	6,507	1,703	4,804	3,726	2,781	4,552	1,955
ANATOMY	69	10	59	41	28	49	20
BIOCHEMISTRY	270	79	191	163	107	192	78
BIOLOGY	2,637	759	1,878	1,537	1,100	1,447	1,190
BIOMETRY/EPIDEMIOLOGY	157	52	105	82	75	110	47
BIOPHYSICS	31	3	28	25	6	31	0
BOTANY	223	43	180	135	88	201	22
CELL BIOLOGY	20	3	17	14	6	17	3
ECOLOGY	106	19	87	76	30	106	0
ENTOMOLOGY/PARASITOLOGY	230	40	190	188	42	226	4
GENETICS	90	9	81	51	39	45	45
MICROBIOLOGY	439	102	337	258	181	366	73
NUTRITION	681	217	464	162	519	583	98
PATHOLOGY	171	44	127	78	93	117	54
PHARMACOLOGY	146	29	117	91	55	63	83
PHYSIOLOGY	320	111	209	213	107	220	100
ZOOLOGY	458	57	401	316	142	437	21
BIOSCIENCES, N.E.C.	459	126	333	296	163	342	117
HEALTH SCIENCES	11,842	4,496	7,346	2,712	9,130	7,737	4,105
ANESTHESIOLOGY	2	0	2	2	0	0	2
CARDIOLOGY	0	0	0	0	0	0	0
CLINICAL PHARMACOLOGY	0	0	0	0	0	0	0
DENTISTRY	172	41	131	129	43	121	51
ENDOCRINOLOGY	6	2	4	2	4	6	0
GASTROENTEROLOGY	0	0	0	0	0	0	0
HEMATOLOGY	0	0	0	0	0	0	0
NEUROLOGY	4	0	4	3	1	4	0
NURSING	5,460	2,601	2,859	189	5,271	3,887	1,573
OBSTETRICS/GYNECOLOGY	3	1	2	1	2	1	2
OPHTHALMOLOGY	0	0	0	0	0	0	0
OTORHINOLARYNGOLOGY	2	0	2	1	1	2	0
PEDIATRICS	3	0	3	1	2	0	3
PHARMACEUTICAL SCIENCES	852	290	562	542	310	208	644
PREVENTIVE MEDICINE/ COMMUNITY HEALTH	1,899	476	1,423	898	1,001	1,133	766
PSYCHIATRY	39	8	31	16	23	26	13
PULMONARY DISEASE	0	0	0	0	0	0	0
RADIOLOGY	63	10	53	60	3	58	5
SPEECH PATHOLOGY/AUDIOLOGY	1,376	362	1,014	174	1,202	1,160	216
SURGERY	2	1	1	2	0	0	2
VETERINARY SCIENCES	250	59	191	161	89	250	0
CLINICAL MEDICINE, N.E.C.	112	57	55	35	77	76	36
HEALTH RELATED, N.E.C.	1,597	588	1,009	496	1,101	805	792
PSYCHOLOGY	7,267	1,410	5,857	3,335	3,932	3,397	3,870
SOCIAL SCIENCES	26,452	8,772	17,680	15,577	10,875	16,720	9,732
AGRICULTURAL ECONOMICS	249	32	217	205	44	249	0
ANTHROPOLOGY	1,460	264	1,196	745	715	1,050	410
ECONOMICS (EXCEPT AGRICULTURAL)	2,848	640	2,208	2,184	664	1,643	1,205
GEOGRAPHY	700	111	589	500	200	642	58
HISTORY AND PHILOSOPHY OF SCIENCE	31	3	28	20	11	17	14
LINGUISTICS	1,352	305	1,047	474	878	890	462
POLITICAL SCIENCE	11,486	4,129	7,357	7,454	4,032	6,151	5,335
SOCIOLOGY	2,809	652	2,157	1,477	1,332	2,153	656
SOCIOLOGY/ANTHROPOLOGY	505	102	403	261	244	173	332
SOCIAL SCIENCES, N.E.C.	5,012	2,534	2,478	2,257	2,755	3,752	1,260

SOURCE: NATIONAL SCIENCE FOUNDATION

appendix c

reproduction of survey instruments

page

Scientific and Engineering Expenditures at Universities and Colleges, FY 1979 and Instructions 64

Scientific and Engineering Personnel Employed at Universities and Colleges, January 1979 and Instructions 69

Graduate Science Student Support and Postdoctorates, Fall 1979, and Instructions 80

NSF FORM 411 (Dec. 1979)

FORM APPROVED
OMB No. 99-R0279

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC AND ENGINEERING EXPENDITURES AT UNIVERSITIES AND COLLEGES, FY 1979

(Current and Capital Expenditures for Research,
Development, and Instruction in the Sciences and Engineering)

Organizations are requested to complete and return this form to:

NATIONAL SCIENCE FOUNDATION
1800 G Street, N.W.
Washington, D.C. 20550
Attn: UNISG

This form should be returned by February 1, 1980. Your cooperation in returning the survey questionnaire promptly is very important.

Financial data are requested for your institution's 1979 fiscal year.

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information you provide will be used for statistical purposes only. Your response is entirely voluntary and your failure to provide some or all of the information will in no way adversely affect your institution.

All financial data requested on this form should be reported in thousands of dollars; for example, an expenditure of $25,342 should be rounded to the nearest thousand dollars and reported as $25.

Where exact data are not available, estimates are acceptable. Your estimates will be better than ours.

Please correct if name or address has changed

Include data for branches and all organizational units of your institution, such as medical schools and agricultural experiment stations. Also include hospitals or clinics owned, operated, or controlled by universities, and integrated operationally with the clinical programs of your medical schools. Exclude data for federally funded research and development centers (FFRDC's). A separate questionnaire is included in this package if your institution administers an FFRDC. **If you have any questions please contact Jim Hoehn (202-634-4674).**

Please enter the beginning and ending dates of your institution's fiscal year for which you are reporting on this form:

______________________ through ______________________

Please note in space below:
(1) Any suggestions to improve the design of the survey questionnaire, (2) any suggestions to improve the instructions, or (3) any comments on significant change in R&D in your institution.

(Attach additional sheets, if necessary.)

PLEASE TYPE OR PRINT NAME OF PERSON SUBMITTING THIS FORM	TITLE	AREA CODE	EXCH	NO.	EXT
NAME OF PERSON WHO PREPARED THIS SUBMISSION (If different from above)	TITLE	AREA CODE	EXCH	NO.	EXT
Please check and correct if necessary the name and address of your institution shown on the mailing label.		DATE			

ITEM 1. CURRENT EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT (R&D) IN THE SCIENCES AND ENGINEERING, BY SOURCE OF FUNDS AND BASIC RESEARCH, FY 1979 (Include indirect costs)

ITEMS 1. & 2. INSTRUCTIONS

Separately budgeted research and development (R&D) includes all funds expended for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. **Include** equipment purchased under research project awards as part of "current funds." Research funds subcontracted to outside organizations should also be included. **Exclude** training grants, public service grants, demonstration projects, etc.

Under a. **Federal Government.** Report grants and contracts for R&D by all agencies of the Federal Government including indirect costs from these sources.

Under b. **State and local governments.** Include funds for R&D from State, county, municipal, or other local governments and their agencies. Include here State funds which support R&D at agricultural experiment stations.

Under c. **Industry.** Include all grants and contracts for R&D from profitmaking organizations, whether engaged in production, distribution, research, service, or other activities. Do not include grants and contracts from nonprofit foundations financed by industry, which should be reported under **All other sources.**

Under d. **Institutional funds.** Report funds which your institution spent for R&D activities including indirect costs from the following sources: (1) General-purpose State or local government appropriations; (2) general-purpose grants from industry, foundations, or other outside sources; (3) tuition and fees; (4) endowment income. In addition, estimate your institution's contribution to unreimbursed indirect costs incurred in association with R&D projects financed by outside organizations, and mandatory cost sharing on Federal and other grants. To estimate unreimbursed indirect costs, many institutions use a university-wide negotiated indirect cost rate multiplied by the base (e.g., direct salaries and wages, etc.) minus actual indirect cost recoveries. If your institution now separately budgets what was previously classified as departmental research, these data should be included in line d.

Under e. **All other sources.** Include foundations and voluntary health agencies grants for R&D, as well as all other sources not elsewhere classified. Funds from foundations which are affiliated with or grant solely to your institution should be included under d. Institutional funds. Funds for R&D received from a health agency that is a unit of a State or local government should be reported under State and local governments. Also include gifts from individuals that are restricted by the donor to research.

Please exclude from your response any R&D expenditures in the fields of education, law, humanities, music, the arts, physical education, library science, and all other nonscience fields.

Source of funds		(1) Total R&D expenditures	(2) Basic research
		(Dollars in thousands)	(Percent of column 1)
a. Federal Government	1110	$	____________ %
*b. State and local governments	1125		**Basic research** is directed toward an increase of knowledge; it is research where the primary aim of the **investigator** is a fuller knowledge or understanding of the subject under study rather than a practical application thereof.
c. Industry	1150		
d. Institutional funds	1160		
(1) Separately budgeted	1161		
(2) Underrecovery of indirect costs and cost sharing	1162		
*e. All other sources	1175		
f. TOTAL (sum of a through e)	1100	$	____________ %

CONFIDENTIALITY

Information received from individual institutions in lines 1161 and 1162, or estimates for basic research expenditures, will **not** be published or released; only aggregate totals will appear in publications.

*Combined data cell (See instructions for b and e).

Total R&D expenditures reported in line 1100 column (1) and line 1400 column (1) should be the same.
Federally financed R&D expenditures reported in line 1100 column (1) and line 1400 column (2) should be the same.

ITEM 2. TOTAL AND FEDERALLY FINANCED EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT, BY FIELD OF SCIENCE, FY 1979 (Include indirect costs and equipment).

Field of science	Illustrative disciplines		(Dollars in thousands)	
			(1) Total	(2) Federal
a. ENGINEERING (TOTAL)	Aeronautical, agricultural, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, nuclear, petroleum, bio- and biomedical, energy, textile, architecture	1410	$	$
b. PHYSICAL SCIENCES (TOTAL)		1420		
(1) Astronomy	Astrophysics, optical and radio, x-ray, gamma-ray, neutrino	1421		
(2) Chemistry	Inorganic, organo-metallic, organic, physical, analytical, pharmaceutical, polymer science (exclude biochemistry)	1422		
(3) Physics	Acoustics, atomic and molecular, condensed matter, elementary particles, nuclear structure, optics, plasma	1423		
(4) Other	Used for multidisciplinary projects within physical sciences and for disciplines not requested separately	1424		
c. ENVIRONMENTAL SCIENCES (TOTAL)	ATMOSPHERIC SCIENCES: Aeronomy, solar weather modification, meteorology, extra-terrestrial atmospheres GEOLOGICAL SCIENCES: Engineering geophysics, geology, geodesy, geomagnetism, hydrology, geochemistry, paleomagnetism, paleontology, physical geography, cartography, seismology, soil sciences OCEANOGRAPHY: Chemical, geological, physical, marine geophysics, marine biology, biological oceanography	1430		
d. MATHEMATICAL AND COMPUTER SCIENCES (TOTAL)		1440		
(1) Mathematics	Algebra, analysis, applied mathematics, foundations and logic, geometry, numerical analysis, statistics, topology	1441		
(2) Computer sciences	Design, development, and application of computer capabilities to data storage and manipulation, information science	1442		
e. LIFE SCIENCES (TOTAL)		1450		
(1) Biological sciences	Anatomy, biochemistry, biophysics, biogeography, ecology, embryology, entomology, genetics, immunology, microbiology, nutrition, parasitology, pathology, pharmacology, physical anthropology, physiology, botany, zoology	1451		
(2) Agricultural	Agricultural chemistry, agronomy, animal science, conservation, dairy science, plant science, range science, wildlife	1452		
(3) Medical	Anesthesiology, cardiology, endocrinology, gastroenterology, hematology, neurology, obstetrics, opthalmology, preventive medicine and community health, psychiatry, radiology, surgery, veterinary medicine, dentistry, pharmacy	1453		
(4) Other	Used for multidisciplinary projects within life sciences	1454		
f. PSYCHOLOGY (TOTAL)	Animal behavior, clinical, educational, experimental, human development and personality, social	1460		
g. SOCIAL SCIENCES (TOTAL)		1470		
(1) Economics	Econometrics, international, industrial, labor, agricultural, public finance and fiscal policy	1471		
(2) Political science	Regional studies, comparative government, international relations, legal systems, political theory, public administration	1472		
(3) Sociology	Comparative and historical, complex organizations, culture and social structure, demography, group interactions, social problems and welfare, theory	1473		
(4) Other	History of science, cultural anthropology, linguistics, socio-economic geography	1474		
h. OTHER SCIENCES, n.e.c. (TOTAL)*	To be used when the multidisciplinary and interdisciplinary aspects make the classification under one primary field impossible	1480		
i. TOTAL (SUM of a through h) Check to insure that column totals are identical with data reported in item 1.		1400		

*PLEASE EXCLUDE FROM YOUR RESPONSE ANY R&D EXPENDITURES IN THE FIELDS OF EDUCATION, LAW, HUMANITIES, MUSIC, THE ARTS, PHYSICAL EDUCATION, LIBRARY SCIENCE, AND ALL OTHER NONSCIENCE FIELDS.

ITEM 3. CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION, BY FIELD OF SCIENCE AND SOURCE OF FUNDS, FY 1979

ITEM 3. INSTRUCTIONS

Report funds for facilities which were in process or completed during FY 1979. Expenditures for administration buildings, steam plants, residence halls, and other such facilities should be excluded unless utilized principally for research, development, or instruction in engineering or in the sciences. Land costs should be **excluded**. Exclude small equipment items in your current fund account costing approximately $300 or less per unit or as recommended by the Joint Accounting Group (JAG) or as determined by your institutional policy; these are to be reported under items 1 and 2.

Facilities and equipment expenditures **include** the following: (a) Fixed equipment such as built-in equipment and furnishings; (b) movable scientific equipment such as oscilloscopes and pulse-height analyzers; (c) movable furnishings such as desk; (d) architect's fees, site work, extension of utilities, and the building costs of service functions such as integral cafeterias and bookstores of a facility; (e) facilities constructed to house separate components such as medical schools and teaching hospitals; and (f) special separate facilities used to house scientific apparatus such as accelerators, oceanographic vessels, and computers.

Field of science		(Dollars in thousands)		
		Total (1)	Federal (2)	All other sources (3)
a. Engineering	1710	$	$	$
b. Physical sciences	1720			
c. Environmental sciences	1730			
d. Mathematical and computer sciences	1740			
e. Life sciences	1750			
f. Psychology	1760			
g. Social sciences	1770			
h. Other sciences, n.e.c.	1780			
i. Total (sum of a through h)	1700	$	$	$

ITEM 4. TOTAL AND FEDERALLY FINANCED CURRENT FUND EXPENDITURES FOR SCIENTIFIC RESEARCH EQUIPMENT, BY FIELD OF SCIENCE: FY 1979

ITEM 4. INSTRUCTIONS

Please report below FY 1979 expenditures for scientific research equipment purchased from **current funds only.** If actual expenditure data are not readily available, please provide estimates. **Equipment** is defined to include articles of nonexpendable tangible personal property having a useful life of more than one year and an acquisition cost of $300 or more per unit. Institutions may use their own definition provided that it at least includes all equipment defined here.

NOTE: These research equipment data should also be included with the separately budgeted R&D expenditures reported in items 1 and 2.

For column (1) report current funds expenditures from all sources: Federal Government; State, county, municipal, or other governments and their agencies (including State funds supporting research and development at agricultural experiment stations); industry, private foundations and voluntary health agencies, individuals and associations; and institutional funds.

For column (2) Federal Government sources include funds from grants and contracts for research and development by all agencies of the Federal Government.

(Dollars in thousands)

Field of Science		(1) Total	(2) Federal
a. Engineering (total)	1810	$	$
b. Physical sciences (total)	1820		
(1) Astronomy	1821		
(2) Chemistry	1822		
(3) Physics	1823		
(4) Other	1824		
c. Environmental sciences (total)	1830		
d. Mathematical and computer sciences (total)	1840		
(1) Mathematics	1841		
(2) Computer sciences	1842		
e. Life sciences (total)	1850		
(1) Biological sciences	1851		
(2) Agricultural	1852		
(3) Medical	1853		
(4) Other	1854		
f. Psychology (total)	1860		
g. Social sciences (total)	1870		
(1) Economics	1871		
(2) Political science	1872		
(3) Sociology	1873		
(4) Other	1874		
h. Other sciences, n.e.c. (total)	1880		
i. TOTAL (sum of a through h)	1800		

OMB No. 99-R0282
Approval Expires December 1980

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC AND ENGINEERING PERSONNEL EMPLOYED AT UNIVERSITIES AND COLLEGES, JANUARY 1979

This survey is directed toward doctorate-granting institutions and their affiliates only. All other institutions will be surveyed in 1980. Organizations are requested to complete and return this form to:

NATIONAL SCIENCE FOUNDATION
1800 G Street, N.W. Room L-602
Washington, D.C. 20550 Attn: UNISG

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information you provide will be used for statistical purposes only. Your response is entirely voluntary and your failure to provide some or all of the information will in no way adversely affect your institution.

Name and address of institution:
(Please correct if name or address has changed)

If your institution does not grant a doctorate degree in the sciences or engineering, please indicate this in the REMARKS of the questionnaire and return it to the address above.

This form represents a reduction in the number of items requested in January 1978 and will be sent on a biennial cycle to doctorate-granting institutions only.

This survey requests scientific and engineering employment data according to institutional recordkeeping conventions. **The completed 1979 questionnaire should be returned by April 20, 1979.** Your prompt cooperation will be appreciated. If you determine, however, that you cannot respond by April 20, notify NSF and request an extension of time.

Please read the enclosed instructions before completing this form. If you have any questions, contact Mr. James Hoehn or Ms. Esther Gist (202–634-4673). Please complete all columns; estimates by academic officials will be better than NSF estimates.

All entries should be in whole numbers; please do not enter decimals or fractions, except in column 6 where one decimal place is optional.

SURVEY POPULATION

Include data for all organizational units of your institution that employ scientists and engineers, such as medical schools, or agricultural experiment stations, nonacademic departments and institutes (include regional campuses and branches). Also include any hospital or clinic owned, operated, or controlled by your university and integrated operationally with the clinical programs of your medical school.

If your institution has a branch campus, a listing is enclosed showing those branches considered by NSF to be part of your institution. If any data for any of these campuses are not included in your final report, please indicate this when submitting your questionnaire.

Exclude data for any federally funded research and development center (FFRDC) administered by your institution; these are to report separately. See listing of FFRDC's administered by academic institutions.

NSF FORM 724S (12-78)

DISCIPLINES 1/		Headcounts			Estimated full-time-equivalents (FTE)		
		Total (1)	Full time (2)	Part time (3)	Total FTE's (Include all activities e.g., teaching, separately budgeted R&D 2/ etc., of all individuals reported in col. 1) (4)	FTE's devoted to separately budgeted R&D 2/	
						Number (5)	Percent (optional) 3/ (6)
a. Engineers (total)	2710						
(1) Aeronautical & astronautical engineers	2711						%
(2) Chemical engineers	2712						%
(3) Civil engineers	2713						%
(4) Electrical engineers	2714						%
(5) Mechanical engineers	2715						%
(6) Other engineers	2716						%
b. Physical scientists (total)	2720						
(1) Chemists	2721						%
(2) Physicists	2722						%
(3) Astronomers	2723						%
(4) Other physical scientists	2724						%
c. Environmental scientists (total)	2730						
(1) Earth scientists	2731						%
(2) Atmospheric scientists	2732						%
(3) Oceanographers	2733						%
(4) Other environmental scientists	2734						%
d. Mathematical & computer scientists (total)	2740						
(1) Mathematicians (exclude computer scientists)	2741						%
(2) Computer scientists (exclude programmers)	2742						%
e. Life scientists (total)	2750						
(1) Agricultural scientists	2751						%
(2) Biological scientists	2752						%
(3) Medical scientists (see instructions, p. 1)	2753						%
(4) Other life scientists	2754						%
f. Psychologists (total)	2760						%
g. Social scientists (total) (exclude historians)	2770						
(1) Economists	2771						%
(2) Sociologists	2772						%
(3) Political scientists	2773						%
(4) Other social scientists	2774						%
h. Total (sum of a thru g)	2700						

1/ See listing entitled, Graduate Programs in the Sciences and Engineering.

2/ See section 9 in Instructions for definition of "separately budgeted R&D expenditures".

3/ If your institution computes the number of FTE's devoted to separately budgeted R&D activities by use of a percentage in each discipline, please do so in col. 6 and use this percentage to compute data in col. 5.

CHECK LIST

( ) 1. Are all entries rounded to whole numbers? Please do not enter fractions or decimals, except in column 6 where one decimal place is optional.

( ) 2. Do the data add to subtotals?

( ) 3. Are all columns completed? YOUR estimates will be better than OURS. An explanation of estimates may be noted on a separate sheet or in the REMARKS.

( ) 4. Are all branches and components such as medical school, computer center, and agricultural experiment station included?

( ) 5. Have you included all postdoctorals?

( ) 6. Have you excluded graduate students?

1978-79 DATA CHECK

Please compare your January 1979 personnel data with your survey response for January 1978, particularly for the totals. Please explain below or on a separate sheet any significant changes; and, where possible, indicate any required adjustments in data reported in previous surveys.

	1978	1979
Total full-time scientists & engineers	Line 2700, col 2.	Line 2700, col 2.
Total part-time scientists & engineers	Line 2700, col 3.	Line 2700, col 3.
Total FTE's	Line 2700, col 4.	Line 2700, col 4.

CONFIDENTIALITY

The National Science Foundation recognizes that its ability to gather much of the enclosed information would be severely impaired if it could not be held in confidence. Please indicate below the number of any items which would not be supplied but for assurance that the source will be held in confidence. The Foundation will hold in confidence such information to the extent permitted by law.

ITEM:

REMARKS

What methods and source records were used for estimating R&D effort?

Please indicate problems encountered in estimating R&D-related activity.

What month did the data come from that were used to complete this survey?

Are there any significant changes in data reported in previous surveys?

PLEASE TYPE OR PRINT NAME OF PERSON SUBMITTING THIS FORM	TITLE	AREA CODE	EXCH	NO.	EXT
NAME OF PERSON WHO PREPARED THIS SUBMISSION (If different from above)	TITLE	AREA CODE	EXCH	NO.	EXT

NAME OF INSTITUTION	DATE	ADDRESS (number, street, city, State, ZIP code)

OMB No. 99-R0282
Approval Expires December 1980

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

SURVEY OF SCIENTIFIC AND ENGINEERING PERSONNEL EMPLOYED AT UNIVERSITIES AND COLLEGES
JANUARY 1979

INSTRUCTIONS AND DEFINITIONS

Introduction

The National Science Foundation requests your cooperation in completing the attached questionnaire covering the personnel characteristics of your institution as they relate to the sciences and engineering. This form requests employment data in 1979 according to institutional recordkeeping conventions. The questionnaire should be completed and returned to NSF by **April 20, 1979.** If you determine, however, that you will not be able to respond by that date, please notify NSF and request an extension of time.

Where data reported in the current survey differ significantly from those reported in the previous survey, please indicate the reasons for the difference, such as "opening of new medical school," etc., at the end of the questionnaire in the "Remarks" section, or on a separate sheet of paper.

The survey procedures are outlined in flow chart format. (See pp 5-8.)

If you have any questions regarding information requested on this form, write or telephone Mr. James Hoehn or Ms. Esther Gist at the Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies, National Science Foundation, 1800 G Street, N.W., Room L-602, Washington, D.C. 20550 (Telephone: 202/634-4673). Additional forms, as well as copies of previous responses, may be obtained by writing to the above address.

Survey Instructions

1. *Survey Population*

This survey, conducted biennially, covers professional employment at all academic institutions granting a doctoral degree (i.e., Ph.D., M.D., D.D.S., etc.) in *any* of the sciences or engineering (S/E) disciplines. The institutional response to this survey should reflect personnel activity in all branches and other units of the parent institution, including regional campuses, medical schools, or an agricultural experiment station.

If your institution has one or more branch campuses, a listing is enclosed showing those branches considered by NSF to be part of your institution for survey purposes. If any data for any of these campuses are not included in your response to NSF, please indicate this under "Remarks" when submitting your questionnaire.

Federally funded research and development centers (FFRDC's) are to report their data separately from the administering university; see the listing of FFRDC's administered by academic institutions (p 4).

2. *Survey Time Period*

The January date referenced in this questionnaire is the point of time when this survey is conducted rather than the actual reporting date of data compiled for NSF. For institutions reporting on the basis of central record systems, data should reflect the date when your files are "frozen" for annual personnel reports. Many institutions, especially those with State affiliation, use their central records compiled in the preceding fall of each year to report to NSF. Please indicate the reporting date of data for your institution in the space provided on the back of the questionnaire.

3. *Professional Employment*

The term "professional," for purposes of this survey, refers to all persons paid a salary or stipend by the responding institution who work at a level at which the knowledge acquired by academic training equal to a bachelor's degree in science or engineering is essential in the performance of duties. Many institutions with central reporting systems use headcounts of *exempt* employees, i.e., those employees who are in the exempt category of the Fair Labor Standards Act

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as amended. Exempt employees are not eligible for overtime payment. Others use EEO6 concepts.

Include: S/E personnel with faculty status, *postdoctorals,*[1] and other professional employees such as systems analysts in computer centers.

Exclude: (1) Personnel on sabbatical or other leave status; (2) personnel employed in branches of your institution located in foreign countries; (3) unpaid voluntary staff; (4) person "unpaid" by the university but paid by the medical school; (5) student health service personnel; (6) those agricultural extension personnel primarily involved in home economics and 4-H youth programs; (7) administrative officers above the level of department chairpersons with titles such as president, academic dean, dean of faculty, provost, chancellor, etc., even though they may devote part of their time to teaching and/or research; (8) all graduate students.

4. *Assignment of Scientists and Engineers (S/E) to NSF Disciplines*

Determination of whether professional employees should be reported in the NSF personnel survey as "scientists and engineers" and their associated disciplines is done by most respondents on the basis of departmental structures. After particular departments are selected for inclusion in the NSF personnel survey, respondents usually classify headcounts of all professional employees into various S/E disciplines according to their primary or home department of assignment. Where individual assignments are split into two departments on a 50-percent basis, classification into a single NSF discipline should be made according to institutional conventions.

See classification of disciplines of employment in the sciences and engineering for the broad and detailed S/E disciplines of employment corresponding to those shown on the questionnaire, with illustrative categories of each discipline (p 4). This discipline-oriented taxonomy is used by institutions that compile their own departmental groupings for this NSF survey. As a separate enclosure in this survey package, you will also find a computer-generated *List of Graduate Programs.*[2] This listing is intended to serve as an additional guideline to assist you in determining how to classify your professional personnel as "scientists and engineers" into various disciplines. While most respondents report S/E headcounts based on departmental structures, NSF recognizes that because of the multidisciplinary nature of many academic activities, degree specialties and departmental assignments may differ (i.e., a Ph.D. in mechanical engineering may be assigned to the department of orthopedics). To promote ease of reporting and consistency of data among institutions, it is suggested that, where these differences are not significant, all professionals in a department be assigned to a single discipline. In other instances, where sizable differences occur, institutional respondents may choose to report professionals employed in a single department into two or more disciplines for the NSF personnel report. For example, an institution may have a single department of electrical engineering and computer science and report individuals into two separate disciplines on the NSF personnel survey according to their degree specialities.

It is important that respondents *include* in the survey scientists and engineers who are appointed to organizational units that are not part of *any* academic department. For example, scientists and engineers employed at a computer center that is not affiliated with a particular academic department should be *included* in the survey. The most prevalent reporting practice for these nonacademic units is to assign groups of individuals to NSF disciplines according to their degree specialties, especially when multidisciplinary activities are prominent.

5. *Medical and Clinical Disciplines*

For purposes of this survey, all M.D.'s, D.D.S.'s, etc., *with faculty or academic appointments* are to be reported, including postdoctorates. NSF considers faculty status given to physicians, dentists, public health specialists, pharmacists, etc., to be an indicator of significant involvement in teaching, clinical investigation, or other R&D activities.

Exclude: (1) All medical practitioners, such as nurse anesthetists, occupational therapists, physical therapists, interns; (2) nurses *with or without faculty or academic appointments* who are primarily involved in direct patient care; (3) scientists whose primary employment is at independent hospitals even though they may perform some teaching or research functions for your institution through cooperative agreements; (4) unpaid voluntary staff at medical or dental schools; and, (5) medical residents unless research training under the supervision of a senior mentor is the prime purpose of the appointment.

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[1] Some institutions without comprehensive central records on the numbers of postdoctorals base their response to this survey on data gathered in the office of the graduate dean as part of NSF's Survey of Graduate Science Student Support and Postdoctorals.

[2] This *Graduate Programs* list covers only graduate S/E programs and is derived from the NSF Survey of Graduate Science Student Support, Fall 1978.

6. *Headcounts of Full-time Scientists and Engineers*

Full-time employees are those individuals available for full-time assignments at the date used for reporting in this survey, or those who are designated as "full time" in an official contract, appointment, or agreement. Determination of "full-time" designation should be based on institutional recordkeeping conventions and standards. Avoid double counting; if, for example, individuals are full-time employees but their assignments involve more than one department (or campus), they should be counted as one full-time employee according to their primary or home department of assignment (or campus).

7. *Full-Time-Equivalent (FTE)*

The FTE reporting concept should reflect the actual utilization of S/E professionals in various disciplines and their involvement in separately budgeted R&D activities. While headcounts are usually reported on the basis of *primary* department of assignment, FTE reporting in various NSF disciplines should reflect multiple appointments. For example, an individual with a 60-percent appointment in electrical engineering and a 40-percent appointment in computer science would be reported in FTE's in two NSF disciplines according to the 60-40-percent split in departmental assignments. Accordingly, the FTE concept converts the number of persons with part-time or split appointments among various disciplines or activities to an equivalent number of full-time persons, in accordance with institutionally agreed upon conventions.

The procedures used to compile FTE data vary from institution to institution, depending largely on the records available. Generally, there are two categories of records available to institutions — budgeting information describing the allocation of personnel resources and/or data reflecting actual rather than planned utilization of the resources.

In converting S/E headcounts into FTE's, the following method is suggested:

a. Categorize headcounts of all exempt employees in S/E departments, medical schools, agricultural experiment stations, research institutes, and other institutional organizational units into one of the NSF disciplines according to primary assignment;
b. Within each discipline, differentiate employees as being either full time or part time (according to institutional practices);
c. Calculate the full-time-equivalents of full-time S/E personnel. Use budgetary or resource utilization records to report S/E employees with split appointments between departments and/or institutional units, and distribute these data according to appropriate NSF disciplines;
d. Calculate the full-time-equivalents of part-time S/E personnel and merge them into appropriate NSF disciplines.

8. *Research and Development* (R&D)

R&D activities are systematic, intensive studies directed toward fuller knowledge of the subject studied. For purposes of this survey, report only the full-time-equivalent involvement of persons engaged in *separately budgeted research and development.* Separately budgeted research and development includes all activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution.

Exclude: Time spent by professional employees on training grants, public service grants, demonstration projects, etc.

Estimating the division of time allocated or spent by individuals in separately budgeted R&D programs is difficult for many institutions. Again, procedures used to supply these data vary among institutions and the extent to which central reporting is feasible depends, by and large, on the degree to which budget/personnel/financial records are mechanized and linked. Among the procedures used by various institutions are the following:

a. Using some generally held criteria at the institutional or departmental levels (i.e., three-fourths for instruction, one-fourth for research);
b. Estimating separately budgeted R&D involvement or assignment obtained from payroll records, personnel records, or from employee contracts (i.e., salaries paid from separately budgeted R&D funds may be compared with total academic salaries of individuals);
c. Asking research administrators, department chairpersons, or heads of other organizational units to furnish estimates of separately budgeted R&D involvement.
d. Using faculty activity analyses in institutions where these are regularly conducted.

Federally Funded Research and Development Centers (FFRDC's)

For purposes of this survey, FFRDC's are defined as R&D organizations exclusively or substantially financed by the Government and administered on a contractual basis by educational institutions or other organizations. The following is a current list of FFRDC's administered by universities and colleges:

- Ames Laboratory
- Argonne National Laboratory
- Brookhaven National Laboratory
- Center for Naval Analyses
- Cerro Tololo Inter-American Observatory
- E. O. Lawrence Berkeley Laboratory
- E. O. Lawrence Livermore Laboratory
- Fermi National Accelerator Laboratory
- Jet Propulsion Laboratory
- Kitt Peak National Observatory
- Lincoln Laboratory
- Los Alamos Scientific Laboratory
- National Astronomy and Ionosphere Center
- National Center for Atmospheric Research
- National Radio Astronomy Observatory
- Oak Ridge Associated Universities
- Plasma Physics Laboratory
- Space Radiation Effects Laboratory
- Stanford Linear Accelerator Center

Classification of Disciplines of Employment in the Sciences and Engineering

ENGINEERING

Aeronautical & Astronomical: aerodynamics, aerospace, space technology.
Chemical: ceramic, petroleum, petroleum refining process.
Civil: architectural, hydraulic, hydrologic, marine, sanitary and environmental, structural, transportation.
Electrical: communication, electronic, power.
Mechanical: engineering mechanics.
Other Engineering: agricultural, industrial and management, metallurgical and materials, mining, nuclear, ocean engineering systems, textile, welding.

PHYSICAL SCIENCES

Chemistry: analytical, inorganic, organo-metallic, organic, pharmaceutical, physical, polymer science (exclude biochemistry).
Physics: acoustics, atomic and molecular, condensed matter, elementary particles, nuclear structure, optics, plasma.
Astronomy: laboratory astrophysics, optical astronomy, radio astronomy, theoretical astrophysics, X-ray, gamma-ray, neutrino astronomy.
Other Physical Sciences: used for multidisciplinary fields within physical sciences.

ENVIRONMENTAL SCIENCES (TERRESTRIAL AND EXTRATERRESTRIAL)

Earth Sciences: engineering geophysics, general geology, geodesy and gravity, geomagnetism, hydrology, inorganic geochemistry, isotopic geochemistry, organic geochemistry, lab geophysics, paleomagnetism, paleontology, physical geography and cartography, seismology.
Atmospheric Sciences: aeronomy, solar, weather modification, extraterrestrial atmospheres, meteorology.
Oceanography: biological oceanography, chemical oceanography, geological oceanography, physical oceanography, marine geophysics.
Other Environmental Sciences: used for multidisciplinary fields within environmental sciences.

MATHEMATICAL AND COMPUTER SCIENCES

Mathematics: algebra, analysis, applied mathematics, foundations and logic, geometry, numerical analysis, statistics, topology.
Computer Sciences: computer programming,[3] computer and information sciences (general); design, development, and application of computer capabilities to data storage and manipulation; information sciences and systems; systems analysis.

LIFE SCIENCES

Agricultural Sciences: agronomy, animal science, dairy science, food science and technology, forestry, horticulture, poultry science.
Biological Sciences: anatomy, bacteriology, biochemistry, biogeography, biophysics, ecology, embryology, entomology, evolutionary biology, genetics, immunology, microbiology, nutrition and metabolism, parasitology, pathology, pharmacology, physical anthropology, physiology, plant sciences, radiobiology, systematics, zoology.
Medical Sciences:[4] internal medicine, neurology, ophthalmology, preventive medicine and public health, psychiatry, radiology, surgery, veterinary medicine, dentistry, pharmacy, podiatry, anesthesiology, chemotherapy, dermatology, geriatrics, nuclear medicine, obstetrics, gynecology, oncology, pediatrics, physical medicine and rehabilitation.
Other Life Sciences: all other health-related disciplines[4].

PSYCHOLOGY: animal behavior; clinical psychology; comparative psychology, counseling and guidance; development and personality; educational, personnel, vocational psychology and testing; experimental psychology; ethology; industrial and engineering psychology; social psychology.

SOCIAL SCIENCES

Economics: agricultural economics; econometrics and economics statistics; history of economic thought; international economics; industrial, labor and agricultural economics; macroeconomics; microeconomics; public finance and fiscal policy; theory; economic systems and development.
Sociology: comparative and historical, complex organizations, culture and social structure, demography, group interactions, social problems and social welfare, sociological theory.
Political Science: area or regional studies; comparative government; history of political ideas; international relations and law; national, political and legal systems; political theory; public administration.
Other Social Sciences: cultural anthropology, criminology, history of science, linguistics, socioeconomic geography, urban studies.

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[3] Personnel employed as computer programmers should *not* be reported as professionals.

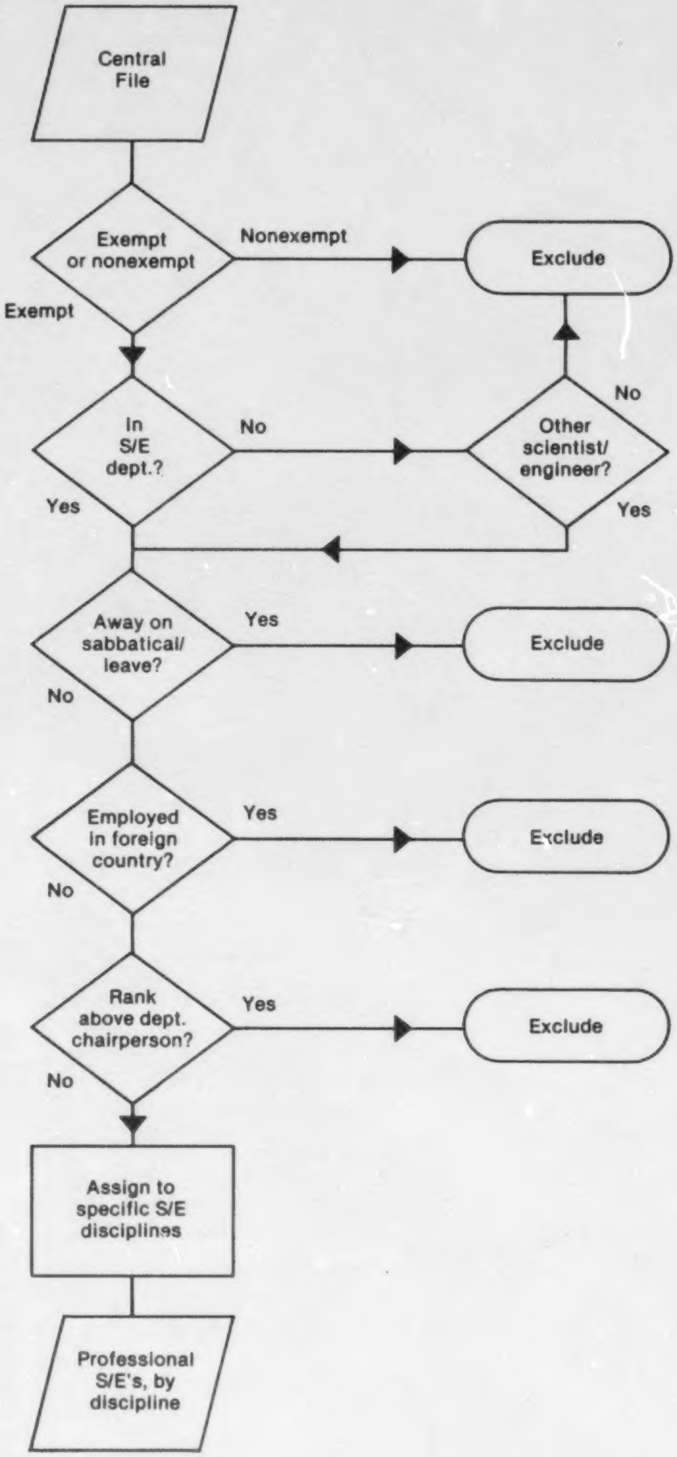
[4] *Exclude* personnel primarily involved in direct patient care.

Flow Charts

Institutions who automate NSF survey data or plan to — or even engage in manual data processing — may be assisted by these charts.

STEP 1:

Retrieve, sort, and select information from central records of institution.


Central File
Exempt or nonexempt
Nonexempt
Exclude
Exempt
In S/E dept.?
No
Other scientist/ engineer?
No
Yes
Yes
Away on sabbatical/ leave?
Yes
Exclude
No
Employed in foreign country?
Yes
Exclude
No
Rank above dept. chairperson?
Yes
Exclude
No
Assign to specific S/E disciplines
Professional S/E's, by discipline

Central File: Contains centralized records for all paid employees. (Note: Some affiliated entities such as medical schools may have their own central files. See below.) Examples: Personnel, payroll, or general financial records.

Select personnel exempt from Fair Labor Standards Act. (See section 3 in Instructions).

Select scientists & engineers (incl. postdoctorates) by "home" department. Exception: if "home" dept. is not science or engineering, and person holds joint appt. in S/E department. See Graduate Programs list enclosed.

See section 3 in Instructions.

See section 3 in Instructions.

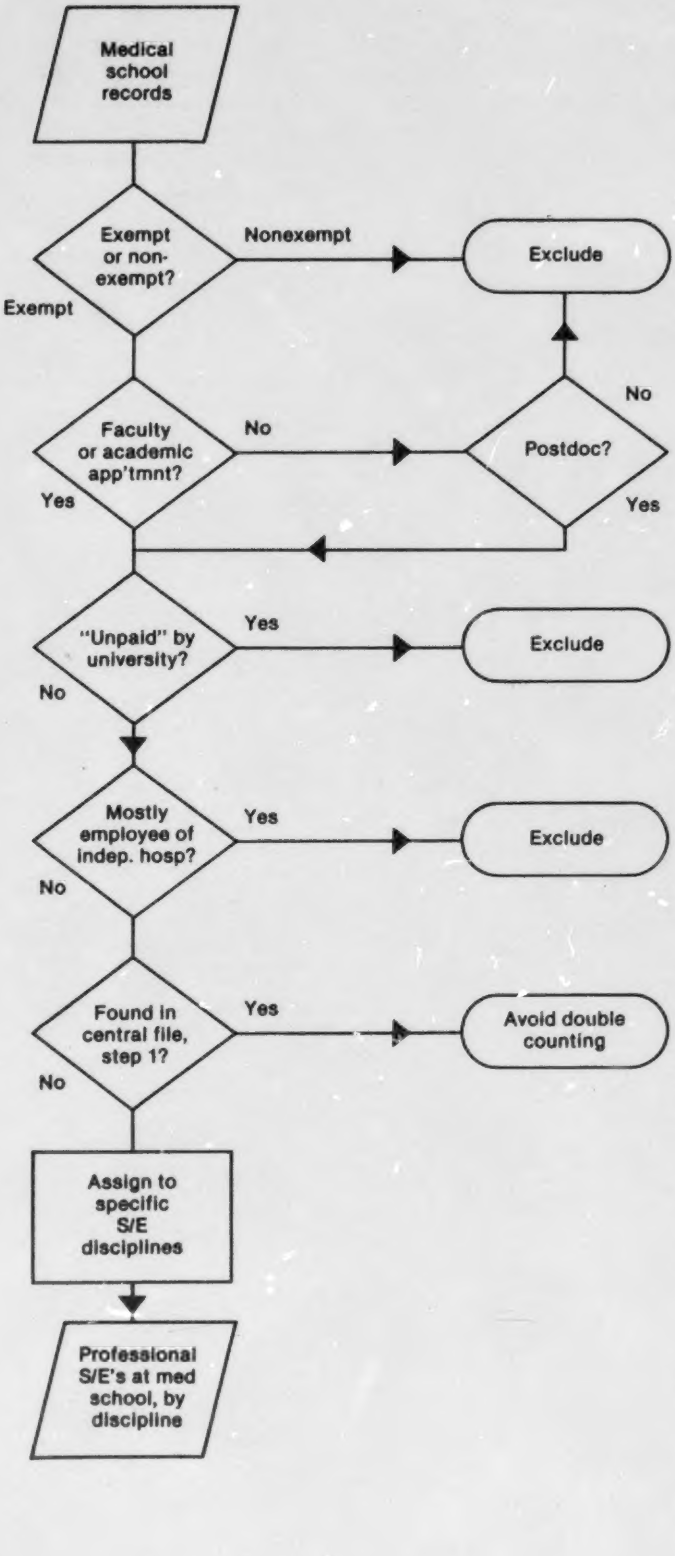
See section 3 in Instructions.

To assign to appropriate disciplines use the NSF-generated Graduate Programs list as a guide linking departments and disciplines, or use your institution's conventions.

At this point you have extracted file containing all professional scientists and engineers covered by central records (but may be limited to those assigned to academic S/E departments in the institution proper).

STEP 2:

Collect information for medical school (if any) if not covered by central file of institution.


Medical school records
Exempt or non-exempt?
Nonexempt
Exclude
Exempt
Faculty or academic app'tmnt?
No
Postdoc?
No
Yes
Yes
"Unpaid" by university?
Yes
Exclude
No
Mostly employee of indep. hosp?
Yes
Exclude
No
Found in central file, step 1?
Yes
Avoid double counting
No
Assign to specific S/E disciplines
Professional S/E's at med school, by discipline

Refer to discussion of medical schools (Section 5 in Instructions).

Select personnel exempt from Fair Labor Standards Act. (See section 3 in Instructions).

Do not include medical school personnel unless they have faculty or academic appointments. Exceptions: postdoctorals. (See section 5 in Instructions.)

Exclude personnel "unpaid" by the university even if paid by the medical school. Exclude voluntary staff.

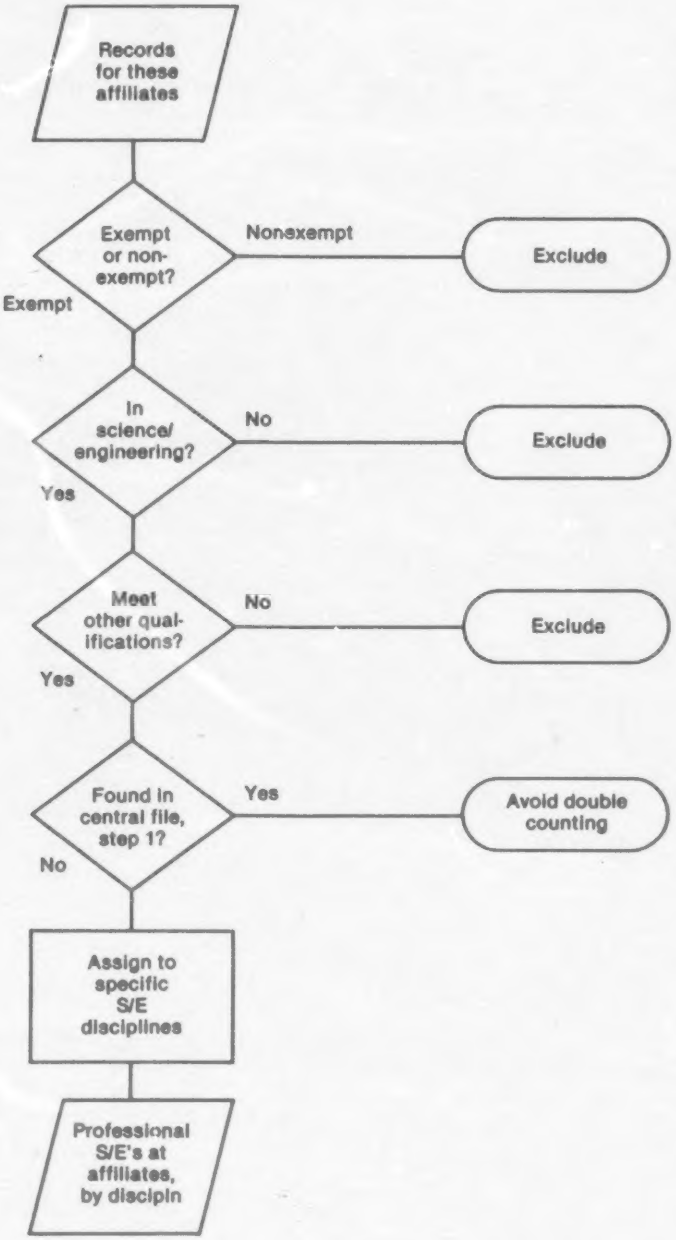
Scientists whose primary employment is at independent hospitals are to be excluded even if they perform teaching/research for your institution through cooperative agreements.

Some individuals may be included in both the institution's central records and the medical school records. Count such persons only once, but keep track of split assignments for FTE figures, below.

Assign the individuals selected to the appropriate NSF discipline categories, using either the NSF-generated Graduate Programs list or your own institution's conventions.

STEP 3:

Collect information on any remaining affiliated entities not covered by files already processed. Such entities might include a regional campus, an agricultural experiment station, a research institute (except for FFRDC's), a computer center, etc. Also check for postdoctorates not included in central files (see footnote to section 4 in Instructions).


Records for these affiliates
Exempt or nonexempt?
Nonexempt
Exclude
Exempt
In science/engineering?
No
Exclude
Yes
Meet other qualifications?
No
Exclude
Yes
Found in central file, step 1?
Yes
Avoid double counting
No
Assign to specific S/E disciplines
Professional S/E's at affiliates, by disciplin

{ See section 1 in Instructions.

{ Select personnel exempt from Fair Labor Standards Act. (See section 3 in Instructions.)

{ See discussions in sections 3 and 4 in Instructions.

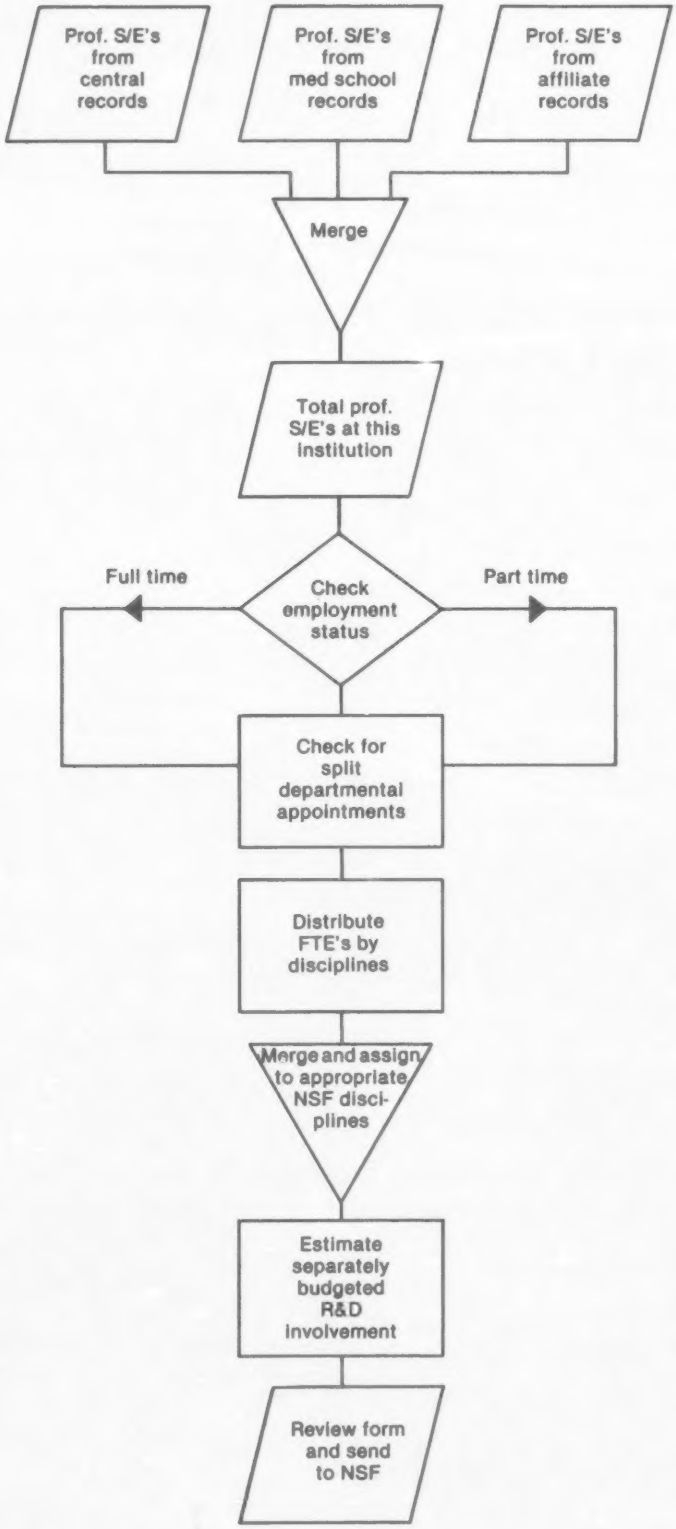
{ Note exclusions listed in section 3 in Instructions (e.g., exclude personnel away on sabbatical and voluntary staff).

{ Some individuals may be included in both the institution's central records and the affiliated entity's files (e.g., a person teaching at both the main and a regional campus). Only count such persons once, but keep track of split assignments for FTE figures, below.

{ Assign the individuals selected to the appropriate NSF discipline categories, using either the NSF-generated Graduate Programs list or your own institution's conventions.

STEP 4:

Merge all extracted information, compute full-time-equivalents in each discipline for both full-time and part-time personnel, and determine extent of separately budgeted R&D


Prof. S/E's from central records
Prof. S/E's from med school records
Prof. S/E's from affiliate records
Merge
Total prof. S/E's at this institution
Full time
Check employment status
Part time
Check for split departmental appointments
Distribute FTE's by disciplines
Merge and assign to appropriate NSF disci- plines
Estimate separately budgeted R&D involvement
Review form and send to NSF

If duplicate entries have not already been eliminated, it may be convenient to do so at this stage.

Use institutional definition for "part-time" employees. (See also discussion of "full time" in section 6 in Instructions.)

FULL TIME: Check for personnel assignments which are split across several disciplines. (See section 7c in Instructions.)

PART TIME: Use institutional conventions or practices to convert numbers of part-time personnel to the equivalent number of full-time individuals in each discipline. (See section 7 in Instructions.)

For all personnel, determine the proportion of time spent in separately budgeted R&D programs. Use institution's conventions or data from faculty activity analyses, salaries paid from research funds, etc. (See section 8 in Instructions.)

All data required for survey have now been collected.

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NSF Form 812, Oct. 79

Form Approved
FEDAC No. R0093
App. Exp. 12/81

NATIONAL SCIENCE FOUNDATION and NATIONAL INSTITUTES OF HEALTH
SURVEY OF GRADUATE SCIENCE STUDENTS AND POSTDOCTORALS, FALL 1979

DEPARTMENTAL DATA SHEET

(NOTE: BEFORE FILLING OUT PLEASE READ THE ATTACHED INSTRUCTIONS.)

Institution and department code

(Leave blank)

1. Name and address of institution: ____________________

2. Science or engineering department (or unit) covered by this data sheet: ____________________

3. Person in department (or unit) preparing this form:

Name: ____________________

Title: ____________________ Phone: (   )

4. Highest degree offered by department in fall 1979 (CHECK ONE ONLY) Master's ________(1) Doctorate ________(2) No graduate degree offered ________(3)

NOTE: IF YOUR DEPARTMENT DOES NOT ENROLL GRADUATE STUDENTS, PLEASE MOVE TO ITEM 8 BELOW.

5. Number of FULL-TIME GRADUATE STUDENTS enrolled for advanced degrees (master's and doctorate) in fall 1979		STUDENTS RECEIVING FINANCIAL ASSISTANCE								SELF-SUPPORTED STUDENTS (Including loans and family sources)	TOTAL FOR ALL SOURCES (Sum of (A) thru (I))
		FEDERAL SOURCES (excluding loans)					NON-FEDERAL SOURCES				
			DHEW								
MECHANISMS OF SUPPORT		Department of Defense (A)	National Institutes of Health (B)	Other DHEW (C)	National Science Foundation (D)	Other Federal sources (E)	Institutional support 1/ (F)	Foreign sources (G)	Other U.S. sources 2/ (H)	(I)	(J)
Graduate Fellowships	(1)										
Graduate Traineeships	(2)										
Graduate Research Assistantships	(3)										
Graduate Teaching Assistantships	(4)										
Other Types of Support	(5)										
FULL-TIME TOTAL	(6)										
For each total on line (6) how many are WOMEN?	(7)										

FOREIGN STUDENTS	(8)	Of the full-time graduate students on line (6), column (J), how many are FOREIGN students?	
FIRST-YEAR STUDENTS	(9)	Of the full-time graduate students on line (6), column (J), how many are FIRST-YEAR students?	

1/ Include support from this university and State and local governments.

2/ Include support from nonprofit institutions, industry, and all other U.S. sources.

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6. NUMBER OF PART-TIME GRADUATE STUDENTS		
PART-TIME TOTAL	(1)	
Of the part-time total on line (1), how many are WOMEN?	(2)	
Of the part-time total on line (1), how many are FIRST YEAR?	(3)	

Check List

☐ 1. Do all entries reflect headcounts and NOT FTE's?

☐ 2. Do the data in items 5, 7, and 8 add to totals?

☐ 3. Have you included all self-supported full-time students in item 5, column I?

☐ 4. Have you excluded M.D., D.D.S., and D.V.M. candidates, interns, and residents (except those enrolled in joint programs with the Ph. D.) from items 5 and 6?

ITEM 7 IS OPTIONAL IN 1979

		U.S. CITIZENS						
7. RACIAL/ ETHNIC BACKGROUND	Of the graduate student totals in items 5 and 6, how many belong to the following racial/ethnic categories?	Black non-Hispanic (A)	Amer. Indian/ Alaskan Native (B)	Asian/ Pacific Islander (C)	Hispanic (D)	White non-Hispanic (E)	Foreign (F)	TOTAL (Sum of A thru F) (G)
	Full time (item 5, line 6, col. J)							
	Part time (item 6, line 1)							

8. Number of POSTDOCTORALS and NON-FACULTY DOCTORAL RESEARCH STAFF		POSTDOCTORALS						OTHER NON-FACULTY DOCTORAL RESEARCH STAFF (G)
		SOURCE OF SUPPORT				TOTAL for all sources A thru D (E)	Of the total in E, how many are FOREIGN? (F)	
		Federal			Non-Federal (D)			
		Fellowships (A)	Traineeships (B)	Research Grants (C)				
TOTAL	(1)							
Of the total on line (1), how many are WOMEN?	(2)							

Please provide any comments which might explain variances from prior year's data:

Item 5: ______________________________

____

Item 6: ______________________________

____

Item 7: Are these data available at the department level? ______________________________

____

Item 8: ______________________________

____

NOTE: This information is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information you provide will be used for statistical purposes only. Your response is entirely voluntary and your failure to provide some or all of the information will in no way adversely affect your institution.

INSTRUCTIONS FOR SURVEY OF GRADUATE SCIENCE STUDENTS AND POSTDOCTORALS, FALL 1979

General Definitions

A *graduate student* is defined as a student enrolled for credit in an advanced-degree program leading to either a master's or Ph.D. degree in fall 1979. M.D., D.V.M., or D.D.S. candidates, interns, and residents should *not* be reported *unless* they are concurrently working for a master's or Ph.D. in a science or engineering field or are enrolled in a joint M.D./Ph.D program. Individuals who already hold an M.D., D.V.M., or D.D.S., master's or Ph.D. degree but who are working on *another* master's or Ph.D. degree are to be counted as graduate students, either full or part time. *Do not* report such individuals as postdoctorals in item 8.

Graduate students performing thesis or dissertation research away from the campus at Government and contractor-owned facilities in the United States are to be included as long as they are enrolled for credit in an advanced-degree program. Students enrolled at a branch or extension center in a foreign country are to be *excluded*.

A graduate student, whether full- or part-time, should be reported in only one department. If any students are in interdisciplinary programs, please be sure that they are counted only once by their "home" department. If a graduate student is enrolled in an inter-institutional program, please report the student only if the degree will be granted by your institution. Please report in terms of headcounts, *not* in full-time-equivalent (FTE) terms.

Item Instructions and Definitions

Highest degree offered, item 4: Check the item which refers to the *highest degree* program offered by this science department in fall 1979. If your department does not offer a graduate degree, but is a department of clinical medicine with or without postdoctorals, check (3).

Full-time graduate students, item 5: A full-time graduate student is defined as a student enrolled for credit in an advanced-degree program (not a regular staff member or a postdoctoral) who is engaged full time in training activities in his/her field of science; these activities may embrace any appropriate combination of study, teaching, and research, depending on *your institution's own policy.* If your department has no full-time graduate students, write "None" in item 5 and move to item 6.

Mechanisms of support, item 5, lines 1-5: Report each full-time graduate student according to the *type of major support* received in the fall of 1979. Students who receive *fellowships or traineeships* should be reported on lines 1 and 2, respectively, if either of these mechanisms constitute the major source of his/her support. The Federal Interagency Committee on Education (FICE) differentiates between the two *fellowship and traineeship* stipends as follows: (1) A fellowship is an award made directly to or on behalf of a student selected in a national competition, to enable him to pursue post-baccalaureate training, and (2) a traineeship is an educational award to a student selected by his university. Except for the student selection process, the terms and conditions of the two types of awards are generally identical. A student receiving primary support from an assistantship should be classified as a research assistant on line 3 or as a teaching assistant on line 4, depending on how he/she spends the majority of his/her time, e.g., a graduate assistant devoting most of his/her time to teaching should be classified as a graduate teaching assistant. All other full-time graduate students should be reported on line 5.

Students receiving financial assistance, item 5, columns (A) thru (H): Report the number of full-time graduate students in the appropriate column according to the source of the largest portion of their support. In determining the source of major support, consider only tuition and other academic expenses. If a graduate student receives stipend support from more than one source, choose the *major* category of support.

Federal sources, columns (A) thru (E): Report the number of full-time graduate students in the appropriate column where they receive the largest portion of their support. Full-time graduate students receiving the largest portion of their support, from Federal Government *loans* should be reported as *self-supported*, column (I).

Department of Defense (DOD), column (A): Report full-time graduate students receiving support from the Department of the Army, Navy, or Air Force. Students receiving their *major* support from the Veterans Administration under the G.I. Bill should be reported under column (E), "Other Federal Sources;" if this form of support does not constitute his/her *major* source, the student should be counted in the appropriate column representing that source.

Department of Health, Education, and Welfare (HEW), columns (B) and (C): Report full-time graduate students receiving support from the institutes or divisions of the

National Institute of Health (NIH) under the column (B): support from all other components of HEW should be reported under column (C), as indicated below:

National Institutes of Health (report in column B):
- Division of Research Resources
- Fogarty International Center
- National Cancer Institute
- National Eye Institute
- National Heart, Lung, and Blood Institute
- National Institute on Aging
- National Institute of Allergy and Infectious Diseases
- National Institute of Arthritis, Metabolism, and Digestive Diseases
- National Institute of Child Health and Human Development
- National Institute of Dental Research
- National Institute of Environmental Health Sciences
- National Institute of General Medical Sciences
- National Institute of Neurological and Communicative Disorders and Stroke

Other HEW (report in column C):

- Alcohol, Drug Abuse, and Mental Health Administration (including National Institute of Mental Health)
- Center for Disease Control
- Food and Drug Administration
- Health Resources Administration
- Health Services Administration
- National Institute of Education
- Office of Education
- Social and Rehabilitation Service

Non-Federal sources, columns (F) thru (H):

Institutional support, column (F): Reports full-time graduate students receiving support from your own institution and State and local governments. Funds given to a university by the Federal Government, such as training grant funds, should be reported under the appropriate Federal agency and NOT reported as *institutional support.*

Foreign sources, column (G): Include support from any non-U.S. source.

Other U.S. sources, column (H): Include support from nonprofit institutions, private industry, and all other U.S. sources.

Self-supported students, column (I): Include full-time graduate students whose major source of support is derived from loans from any source and from personal or family financial contributions. Full-time graduate students receiving the largest portion of their support from Federal loans should be reported here.

Women, line 7: Report all women students by their source of major support. Please note that in each column, data on line 7 should not exceed the total on line 6.

Foreign students, line 8: A *foreign* full-time graduate student is defined as an individual who has not attained U.S. citizenship. Do not include native residents of a U.S. possession, such as American Samoa. Applicants for U.S. citizenship are to be considered as *foreign* until the date their citizenship becomes effective.

First-year students, line 9: A first-year graduate student is defined as one who will have completed *less than a full year* of graduate study as of the beginning of the fall term in 1979 *in the program in which he/she is enrolled for a degree.* All other graduate students should be considered beyond their first year.

Part-time graduate students, item 6: A part-time graduate student is defined as a student who is enrolled in an advanced-degree program who is NOT pursuing graduate work full time as defined in item 5. Report the *total* number of part-time graduate students on line 1; if a department has no part-time graduate students, enter "None" and move to item 7.

Racial/ethnic background, item 7 (Optional in 1979): This item has been designated as optional for the fall 1979 survey year, in order to determine the availability of racial/ethnic data at the department level. We would appreciate your full cooperation in completing item 7 this year; however, if data are unavailable, please note this in the "Comments" section at the bottom of the form. Racial/ethnic designations as used in this survey do not denote scientific definitions of anthropological origins; a graduate student may thus be included in the group to which he/she appears to belong, identifies with, or is regarded in the community as belonging. However, no person should be counted in more than one racial/ethnic group. The following racial/ethnic designations are those defined by the Office of Civil Rights:

U.S. CITIZENS:

Black, non-Hispanic, column (A): Report persons having origins in any of the black racial groups (except those of Hispanic origin).

American Indian or Alaskan Native, column (B): Report persons having origins in any of the original peoples of North America.

Asian or Pacific Islander, column (C): Report persons having origins in any of the original peoples of the Far East, Southeast Asia, or the Pacific Islands. These areas include China, Japan, Korea, the Philippine Islands, and Samoa.

Hispanic, column (D): Report persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.

White, non-Hispanic, column (E): Report persons having origins in any of the original peoples of Europe, North Africa, the Middle East or the Indian subcontinent, except those of Hispanic origin.

In column (F) report the number of foreign students as defined earlier.

On line 1 report the total number of full-time graduate students under the appropriate racial/ethnic category. Item 7, line 1, column (G) should equal the full-time total reported in item 5, line 6, column (J). Similarly, the total number of part-time graduate students should be reported on line 2. Item 7, line 2, column (G), should equal the part-time total reported in item 6, line 1.

Postdoctorals and nonfaculty doctoral research staff, item 8: Under this category, include individuals with science or engineering Ph.D.'s, M.D.'s, D.D.S.'s, or D.V.M.'s (including foreign degrees that are equivalent to U.S. doctorates) who devote *full time to research* activities or study in the department under temporary appointments carrying no academic rank. Such appointments are generally for a *specific time period.* They may contribute to the academic program through seminars, lectures, or working with graduate students. Their postdoctoral activities provide additional training for them. Exclude appointments in residency training programs in medical and health professions, unless *research training* under the supervision of a *senior mentor* is the *primary purpose* of the appointment. On line 1, under columns (A) and (B), enter the number of fellows and trainees receiving support under Federal fellowships and/or training grants. Under column (C) enter the number of postdoctorals who are receiving federally supported research grants. Those remaining postdoctoral appointees receving non-Government support should be entered under column (D). Of the *total* in column (E), enter the column (F) the number of postdoctorals with *foreign* citizenship. Under *other nonfaculty doctoral research staff,* column (G), report all doctoral scientists and engineers who are principally involved in research activities but who are considered *neither* postdoctoral appointees nor members of the *regular* faculty. On line 2, report the number of women in each category; please note that in each column, data on line 2 should not exceed the total on line 1.

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